BOOK OF ABSTRACTS

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Professor Asima Chatterjee Foundation Kolkata (PACFK),
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Biswa Bangla Biswabidyalay
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Kolkata-700009

Asima Chatterjee

ICCHD-2025

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ORGANIZING SUB-COMMITTEES

Souvenir

Professor Sunil Kumar Talapatra* (talapatrask@gmail.com)

Professor Julie Banerji* (abreschem@gmail.com)

Professor Bani Talapatra* (banitalapatra@yahoo.co.in)

Professor Avijit Banerji* (abreschem@gmail.com)

Dr. Sumitra Chaudhuri* (Secretary, PACFK)

Dr. Anindya S. Manna* (anindyasmanna@gmail.com)

Dr. Krishna Chattopadhyay* (krishchem001@gmail.com)

Ms. Antara Roy (antararoy1993@gmail.com)

Mr. Sandip Das (sandipdas0786@gmail.com)

Dr. Soumyadeep Mitra (smdpmitra@gmail.com)

Ms. Prajita Kundu (CU, Scholar)

Dr. Moupiya Ghosh (moupiyaghosh29091994@gmail.com)

Dr. Anindita Ghosh (aninschem@gmail.com)

Finance & Accounts

Prof. Dilip K. Maiti (dkmchem@caluniv.ac.in)

Prof. Dulal C. Mukherjee (dcm_chem@yahoo.co.in)

Dr. Kaliprasanna Dhara (chemkpd@gmail.com)

Registration & Reception

Dr. Sanchita Goswami* (CU, Professor)

Dr. Sumitra Chaudhuri* (Secretary, PACFK)

Dr. Anindita Ghosh* (aninschem@gmail.com)

Dr. Krishna Chattopadhyay* (krishchem001@gmail.com)

Ms. Antara Roy* (antararoy1993@gmail.com)

Dr. Anindya S. Manna* (anindyasmanna@gmail.com)

Ms. Debanjana Bag (debanjana.bag@gmail.com)

Ms. Aditi Banerjee (aditibanerjee9674@gmail.com)

Ms. Mousumi Bhul (mousumibhul99@gmail.com)

Ms. Pallabi Roy (roypallabi951@gmail.com)

Ms. Riya Ghanti (riya.ghanti.396@gmail.com)

Ms. Anindita Das (chem.anindita@gmail.com)

Ms. Sharmistha Bera (Sanchita Madam lab)

Ms. Anindita Sarkar (aninditasarkar318@gmail.com)

Ms. Swarnali Ghosh (swarnalighosh1998@gmail.com)

Ms. Pratyasha Adak (pratyashaadak7@gmail.com)

Ms. Ankita Haldar (ankitahalder4431@gmail.com)

Transport & Accommodation

Dr. Atanu Mitra*(mitatanu@gmail.com)

Dr. Manas Mandal*(manasmandal26@gmail.com)

Dr. Hari Shankar Biswas* (harishankarb7@gmail.com)

Dr. Debabrata Barman (debabratabarmanchem@gmail.com)

Dr. Aranya Das (dasaranya00@gmail.com)

Dr. Rajesh Nandi (rajeshnandi652@gmail.com)

Mr. Shobhon Aich (shobhonaich@gmail.com)

Mr. Saikat Sarkar (saikat8855@gmail.com)

Mr. Deepak Chowdhury (deepakchowdhury75@gmail.com)

Mr. Md. Tanjul Hoque (tanjulhoque.ma35@gmail.com)

Mr. Pintu Pratihar (pintupratihar417@gmail.com)

Md. Hussain Sanfui (hussainsanfui95 @gmail.com)

Mr. Preetam Nandi (preetamnandy890@gmail.com)

Mr. Subhasis Pal (subhasis97pal@gmail.com)

Mr. Sk. Sujauddin (sujask053@gmail.com)

Mr. Surajit Das (das.surajitdas18@gmail.com)

Mr. Prasenjit Maity (maityprasenjit464@gmail.com)

Mr. Soumya Koley (kolaysoumya50@gmail.com)

Mr. Sourav Bachhar (souravbachhar2015@gmail.com)

Mr. Supratim Das (das94321@gmail.com)

Mr. Abhishek Pal (abhisekpal1997@gmail.com)

Mr. Saiful Islam (isaiful493@gmail.com)

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Prof. Mijanur Rahman* (N R Sen Hall/ mrmchem@caluniv.ac.in)

Prof. Ramananda Maity* (Meghnath Saha Hall, rmchem@caluniv.ac.in)

Prof. Sanchita Goswami* (Chemistry Hall no. 44/, sgchem@caluniv.ac.in)

Prof. Sanjoy Bhar* (sanjay.bhar@jadavpuruniversity.in)

Dr. Subhas Samanta* (sschem@caluniv.ac.in)

Dr. Nilay Karchaudhuri*(nilaychemistry@gmail.com)

Dr. Masum Nawaz (nawaz.masum@hyderabad.bits-pilani.ac.in)

Dr. Anindya S. Manna (anindyasmanna@gmail.com)

Dr. Rajjakfur Rahaman (razzaqchem@gmail.com)

Dr. Debasish Ghosh (debasishghosh2609@gmail.com)

Dr. Poulami Hota (poulamihota@gmail.com)

Ms. Shrestha Roy (shrestharoy642@gmail.com)

Mr. Prakash K. Mandal (prakashkr.mandal24@gmail.com)

Ms. Antara Roy (antararoy1993@gmail.com)

Ms. Prajita Kundu (kunduprajitapakhi@gmail.com)

Ms. Nadira Hassan (nadirahassan250@gmail.com)

Ms. Debarati Mondal (debaratimandal11@gmail.com)

Ms. Ankita Haldar (ankitahalder4431@gmail.com)

Ms. Damayantee Dan (damayantee.official@gmail.com)

Ms. Srijani Karmakar (srikar1177@gmail.com)

Ms. Piyali Das (daspiyali@gmail.com)

Ms. Sarmishtha Bera (CU, Scholar)

Mr. Debojyoti Das (CU, Scholar)

Mr. Paritoh Barik (CU, Scholar)

Mr. Subhadeep Kar (CU, PG)

Dr. Manosi Das (das@redifmail.com)

Dr. Sudipto Debnath (debnath1304@gmail.com)

Mr. Sandip Das (sandipdas0786@gmail.com

Mr. Nayan Bhunia (nayanbhunia8836@gmail.com)

Dr. Tanmoy Ghosh (tanmoyghoshchem@gmail.com)

Dr. Soumyadeep Mitra (smdpmitra@gmail.com)

Ms. Pratyasha Adak (pratyashaadak7@gmail.com)

Dr. Debabrata Barman (debabratabarmanchem@gmail.com)

Ms. Juheli sadhukhan (CU/ Scholar)

Ms. Mousumi Bhul (mousumibhul99@gmail.com)

Ms. Swarnali Ghosh (swarnalighosh1998@gmail.com)

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Poster Section

Prof. Kuntal Pal[$] (Radio physics Hall / kpchem@caluniv.ac.in)
Prof. Ramananda Maity[$] (Meghnath Saha Hall, rmchem@caluniv.ac.in)
Dr. Subhas Samanta[$] (sschem@caluniv.ac.in)
Dr. Manab Chakravarty[$] (manab@hyderabad.bits-pilani.ac.in)
Dr. Amrita Chatterjee[$] (amrita@goa.bits-pilani.ac.in)
Dr. Apurba Lal Koner[$] (akoner@iiserb.ac.in)
Dr. Atanu Mitra[$] (mitatanu@gmail.com)
Dr. Manas Mandal[$] (manasmandal26@gmail.com)
Dr. Nilay Karchaudhuri*(nilaychemistry@gmail.com)
Dr. Anindya S. Manna* (anindyasmanna@gmail.com)
Dr. Tanmoy Ghosh (tanmoyghoshchem@gmail.com)
Dr. Masum Nawaz (nawaz.masum@hyderabad.bits-pilani.ac.in)
Dr. Rajjakfur Rahaman (razzaqchem@gmail.com)
Mr. Nayan Bhunia (nayanbhunia8836@gmail.com)

Oral Section

Dr. Inamur Rahaman Laskar[$] (ir_laskar@pilani.bits-pilani.ac.in)
Prof. Sanjoy Bhar[$] (sanjay.bhar@jadavpuruniversity.in)
Dr. Sukla Ghosh[$] (maitisuklaghc@yahoo.co.in)
Dr. Subhas Samanta[*] (sschem@caluniv.ac.in)
Dr. Rajesh Nandi (rajeshnandi652@gmail.com)
Ms. Sharmistha Bera (sharmistha23011996@gmail.com)

Food & Refreshment

Prof. Somnath Ghosh* (Member, PACFK)
Prof. Manas Chakrabarti* (Assistant Secretary, PACFK)
Dr. Kaliprasanna Dhara* (kali.dhara@gmail.com)
Dr. Anindya S. Manna* (anindyasmanna@gmail.com)
Dr. Rajesh Nandi (rajeshnandi652@gmail.com)
Mr. Nayan Bhunia (nayanbhunia8836@gmail.com)
Mr. Sandip Das (sandipdas0786@gmail.com)
Dr. Tanmoy Ghosh (tanmoyghoshchem@gmail.com)

NOTE:

*Person in-Charge
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A Tribute

PROFESSOR (MRS.) ASIMA CHATTERJEE (1917-2006)

Early Life and Education

Mrs. Asima Chatterjee (neé Mookerjee) was born in Calcutta (now known as Kolkata) on September 23, 1917, being the elder of two children of Late Dr. Indranarayan Mukherjee and Late Sm. Kamala Devi. She passed her Matriculation Examination in 1932, from Bethune Collegiate School, Kolkata, (founded by Mr. John Elliot Drinkwater Bethune on 7th May 1849) securing a Bengal Government Scholarship. In 1934 she passed the I.Sc. Examination from Bethune College and obtained a Bengal Government Scholarship, Nawab Latif – Father Lafont Scholarship of the University of Calcutta and the Hemprova Bose Memorial Medal of the Sadharan Brahma Samaj. She graduated with Honours in Chemistry in 1936 from Scottish Church College and received the Basanti Das Gold Medal. She was the only woman student (out of the three admitted) in the Chemistry Department of the Scottish Church College who completed higher education. Coming from an orthodox, joint Hindu family, severe objections were raised by the elders in allowing Miss Mookerjee to study in a co-education college. It was the courage and sheer determination of ***her Mother*** which enabled her to do so. During her post-graduate studies at the University of Calcutta she came into close contact with the doyens of Indian Science, like Acharya Prafulla Chandra Ray, Professors Prafulla Chandra Mitter, Pulin Behari Sarkar, Jogendra Chandra Bardhan, Priyada Ranjan Ray and Dr. Prafulla Kumar Bose, who later joined Bose Institute as Professor and Head of the Department of Chemistry. She obtained her M.Sc. degree in 1938 with Organic Chemistry as special paper and received the University of Calcutta Silver Medal and Prize (ranking 2nd in the first class) and Jogmaya Devi Gold Medal. Miss Mookerjee started her research work under the guidance of Dr. Prafulla Kumar Bose, one of the pioneer Natural Products chemists in India. Acharya Prafulla Chandra Ray created a fellowship for her (amounting to Rupees seventy-five at that time) out of his salary which he used to donate to the University of Calcutta every month. Miss Mookerjee received the Nagarjuna Prize and Gold Medal of the University of Calcutta in 1940 for the best piece of research work carried out in the Department of Chemistry, the Premchand Roychand Studentship in 1942, the Mouat Gold Medal (one of the prestigious medals of the University) and the D.Sc. degree of the University of Calcutta in 1944 on the merit of her research contributions on Naturally Occurring Indole Alkaloids and Coumarins. She was the first lady to obtain the D.Sc. degree of any Indian University.

Miss Mookerjee was interested in vocal music since her childhood. She received training in classical music, *Dhrupad* and *Khayal*, for over fourteen years and stood second in the All Bengal Music Competition in 1933. When Sir C.V. Raman received the Nobel Prize in 1930 she sang in the felicitation function at the Calcutta University Institute. Her parents took special care to see that she was well conversant in Sanskrit which enabled her to read the great ***epics*** of the renowned writers of ancient India.

In 1940 Miss Mookerjee joined Lady Brabourne College (one of the *prestigious colleges in Kolkata*) as the **Founder-Head** of the Department of Chemistry. She was appointed **Honorary Lecturer** in the Department of Chemistry, University of Calcutta, in 1944.

Dr. (Mrs.) Chatterjee (née Miss Mookerjee) left for U.S.A. in 1947 on study leave from Lady Brabourne College. She showed considerable courage in taking her eleven month old daughter with her along with a governess. There she came into close contact with Swami Nikhilanandaji Maharaj, head of the

Ramakrishna-Vivekananda Centre, New York, and Swami Prabhavanandaji Maharaj, head of the Ramakrishna-Vedanta Centre in Los Angeles. Thus began her life-long association with them and subsequently with the Ramakrishna Math and Mission, Belur, West Bengal. Swami Abhayanandaji Maharaj (the senior most Vice-President of the Ramakrishna Order; popularly known as Bharat Maharaj) and Swami Rangathanandaji Maharaj (13th President of the Ramakrishna Order) Ramakrishna Math and Mission, played a dominant role in her life in providing inspiration and courage.

Dr. (Mrs.) Chatterjee worked with Professor L.M. Parks, University of Wisconsin, on *Naturally Occurring Glycosides* (1947-1948) and with Professor L. Zechmeister, California Institute of Technology, Pasadena, on *Carotenoids* and *Provitamin* A (1948-1949). In recognition of this work she was awarded the coveted *Watumull fellowship*. (Mrs.) Chatterjee worked with Professor P. Karrer, N.L., University of Zürich, Switzerland (1949-1950) on *Biologically Active Indole Alkaloids* which became her life long interest. During her stay at the California Institute of Technology she came into close contact with Professor Linus Pauling, N.L. She made it a point to attend his classes. Thus began her life long association with Professor and Mrs. Pauling. When they came to Calcutta (now known as Kolkata) in 1967 they visited Professor Chatterjee at the University College of Science and met her research students.

Family Background

In 1945 Miss Mookerjee married Dr. Baradananda Chatterjee, F.N.A., a well-known physical chemist who was an authority on Soil Science and Corrosion and was a member of the Railway Board on Corrosion. He became Professor and Head of the Department of Chemistry and Geology and Vice-Principal (Academic) of Bengal Engineering College (now known as Indian Institute of Engineering Science and Technology). Professor Chatterjee had a profound influence on his wife. Without his constant inspiration, encouragement and co-operation it would have been impossible for Mrs. Chatterjee to dedicate herself to the cause of science. Her only child, Dr. Mrs. Julie Banerji, former Head of the Department of Chemistry, University of Calcutta, and son-in-law, Dr. Avijit Banerji, former Head of the Department of Chemistry, University of Calcutta, and Programme-Coordinator, UGC Centre of Advanced Studies on Natural Products including Organic Synthesis, were Professors in the Department of Chemistry, Calcutta University. Her only grandchild, Dr. Aniruddha Banerji, has a brilliant academic career. He is inclined to life sciences – obtaining his B.Sc. (Zoology Honours) and M.Sc. in Zoology from Calcutta University, he secured the first position in both the examinations. Working at the Chittaranjan National Cancer Institute, Kolkata, with a CSIR-NET fellowship he obtained his Ph.D. degree in Life Sciences from Jadavpur University. He joined St. Xavier's College, Calcutta (*one of the most prestigious colleges in India*) as Assistant Professor in the newly opened Department of Biotechnology offering an integrated five-year M.Sc. course. He is now an Associate Professor in the same Department. Her grand daughter-in-law, Dr. (Mrs.) Pia Banerji, is Assistant Professor in the Department of Economics, St. Xavier's College.

The year 1967 proved disastrous for Professor (Mrs.) Chatterjee. She lost her father and then her husband within a period of four months. Unable to bear this double tragedy, she suffered a massive heart attack at the University College of Science and had to be hospitalised in a critical state. She lingered between life and death for days. It took nearly three months for her recovery but by then she had broken down completely. It was through the influence and affection of Revered Late Swami Abhayanandaji Maharaj of the Ramakrishna Math and Mission, Belur, and Late Professor Satyendra Nath Bose, F.R.S. that she regained her mental strength. The love and affection of her students, colleagues and staff members of the Department of Chemistry helped in bringing her back to normal activities.

Professional Career

After her return to India in 1950, Dr. (Mrs.) Chatterjee started research on alkaloids and coumarins. She had rejoined her services as Head of the Department of Chemistry at Lady Brabourne College and Honorary Lecturer in the Department of Chemistry, University of Calcutta. In those days, scholarships were rare and financial assistance most inadequate. As a result the students often had to work in shifts. Those were indeed hard days for any teacher and frustrating for students who pursued research. Dr. (Mrs.) Chatterjee kept up the morale of her students through her own dedication.

In 1954 she was appointed Reader in the Department of Chemistry, University of Calcutta. At that time there was only one post of Reader in the department. Soon she gained reputation as a teacher of rare distinction and an unique research guide. In 1962 she became the Kumar Guruprasad Singh Khaira Professor of Chemistry, a chair she held till her retirement in 1982.

In 1969, she became the Head of the Department of Chemistry, University of Calcutta, a post she continued till 1979. Due to her untiring efforts, understanding and coordination with her colleagues and under her dynamic leadership and foresight the department earned international reputation as a leading Centre of Teaching and Research in Chemistry. One would remember her eloquent address as General President at the 62nd Session of the Indian Science Congress in Delhi in 1975, “Universities constitute the backbone of Scientific and Technological Training and University Research still forms the spearhead of scientific progress and provides a reasonably good barometer to the Standard of Science and Technology in the Country. Hence Universities should receive top national priority”.

Professor (Mrs.) Chatterjee was not satisfied with merely transmitting the facts of science to her students but she instilled in them an awareness of the significance of all they were learning – a rare skill which required a high degree of competence in the art of communication. In recognition of the work carried out in the Organic Section of the Department of Chemistry, the University Grants Commission sanctioned in 1972 the Programme of Special Assistance to selected departments for intensifying teaching and research on ***Natural Products Chemistry*** with Professor (Mrs.) Chatterjee as its Honorary Programme Coordinator. She continued in this post till 2003. This department was upgraded to the Centre of Advanced Studies on Natural Products in 1985 and since 2003 as the Centre of Advanced Studies on ***Natural Products including Organic Synthesis,*** with Professor Avijit Banerji as Honorary Programme Coordinator. In the period 1975-1978 the Organic Section of the Department of Chemistry received the first phase of the UNESCO-UNDP assistance with substantial grants for purchase of equipments and fellowships for teachers and one technician of this section for training abroad. Incidentally, this was the only Organic Chemistry Department in this country to receive such an assistance at that time. The second phase of the assistance continued till 1982. At that time there was serious dearth of space in the Department. Professor (Mrs.) Chatterjee brought funds from the University Grants Commission (New Delhi) and three floors were constructed in the N.R. Sen Building. The rooms have been used for installation of sophisticated instruments, as research laboratories for teachers and for expansion of the departmental library.

Professor (Mrs.) Chatterjee has travelled far and wide, not only in connection with the dissemination of the fruits of her research to the world community, but also to gain knowledge on the progress of research in her area of specialisation. She delivered a number of *Oration* and *Convocation* lectures in Universities and Institutes throughout India. She acted as Chairperson and delivered lectures in the UNESCO Symposia on Phytochemistry held in Kualalampur (1957) and Hongkong (1961), in the IUPAC Symposia on Chemistry of Natural Products held in Zürich (1955), Australia (1960), Japan (1965) and USSR (1970). She participated in the meetings of the British Association for the Advancement of Science in 1970 and 1971. As a member of the Indian delegation she visited several Universities and Institutes in USSR in 1965 on an Indo-Soviet Cultural Exchange Programme. She delivered invited/plenary lectures in the Indo-Soviet Symposia in USSR (Riga – 1971; Tashkent – 1973; Tbilsi (Georgia) – 1983), the Sri Lanka Science Congress in 1976, the International Symposium on Isoprenoids in Poland in 1979 and the first Princess Congress on Natural Products in Bangkok in 1987. As a guest of the German Academy of Science in 1975 Professor (Mrs.) Chatterjee visited the Universities of Berlin, Frei, Ruhr and Bonn on a lecture/study tour. She also delivered lectures in the Universities of Manchester and East Anglia and visited the Imperial Chemical Industries, U.K., as a guest of the British Council in 1975. As a member of the national delegation, Government of India, Professor (Mrs.) Chatterjee attended the World Congress of Women in Prague, Czechoslovakia, which was organised by WIDF (Women International Democratic Federation) and spoke on “Women and Work, including Rural Women” in 1981. She revisited U.S.A. in 1981 on a lecture tour and also Germany in 1981, 1986 and 1987. She went to Bulgaria in 1986 and 1987 and revisited Zürich in 1986. As she began taking more and more life-saving drugs she was compelled to stop all visits abroad and as the condition of her heart deteriorated still further, she could not leave Kolkata and was only permitted to come to the University College of Science (Calcutta University) which was a few kilometres away from her home.

In 1968 Professor (Mrs.) Chatterjee was involved in one of the historic legal battles in the country in the

Calcutta High Court over infringement of a patent right involving a “Sulphonamide Derivative” between Bengal Chemical and Pharmaceutical Works Ltd., Kolkata (now a Government of India Enterprise) and Hoechst Co. Ltd. Due to her profound respect and devotion for her teacher, Late Acharya Prafulla Chandra Ray (Founder of Bengal Chemical and Pharmaceutical Works Ltd.), she agreed to be the principal witness for the Indian Company on condition that she would not accept any fees. Professor Dukshaharan Chakraborty (the then Head of the Department and Sir Rashbehari Ghose Professor of Chemistry, University of Calcutta) was the principal witness for Hoechst Co. Ltd. Late Barristers Rathin Deb and Barrister Somnath Chatterjee (the former Speaker of the Lok Sabha) were the lawyers for Bengal Chemical and Pharmaceutical Works Ltd. while the lawyers for Hoechst Co. Ltd. were eminent patent lawyers from abroad. Professor (Mrs.) Chatterjee’s profound knowledge of Organic Chemistry, courage and conviction helped Bengal Chemical Pharmaceutical Works Ltd. in winning the legal battle. She literally had to answer hundreds of questions in Chemistry for days together in the Calcutta High Court, standing in the Witness Box. It was a critical situation for the Indian Company for if it had lost the case it would have to go into liquidation on account of the astronomical amount of libel suit sought by Hoechst Co. Ltd. Even today, the judges and lawyers of the Calcutta High Court, who were present at that time remember Professor Chatterjee with devotion, awe and profound respect as several of them recalled this historic legal battle to her daughter on learning of her passing away.

This case was historic on three ways: -

(i) The Bombay High Court in an earlier similar case gave the verdict just opposite to the Calcutta High Court.

(ii) The Government of India changed the Patent Law after this legal battle (*Asima Chatterjee. Doyen in the Chemistry of Natural Products by Dhrubajyoti Chattopadhyay, Head Purulia Science Centre under NCSM; Science and Culture, Vol. 84, Nos. 5-6, May-June 2018*).

(iii) Had the judgement gone the way of Hoechst, then BCPW Founded by Acharya Prafulla Chandra Ray would have been forced to close down.

Notable Scientific Contributions

The research activities of Professor (Mrs.) Asima Chatterjee extended over a period of nearly sixty years. Her major interest was on the Chemistry of Natural Products from Indian Medicinal Plants. She, along with her scores of research students and research associates, made significant contributions in diverse classes of natural products, of which alkaloids, polyphenolics and terpenoids deserve special mention, and also on structural and mechanistic organic chemistry. Besides her keen interest on fundamental research, Professor Chatterjee always stressed on the utilization of phytochemicals from indigenous plants as drugs and drug-intermediates. Only ***some*** of her important contributions have been highlighted in the following sections.

A large number of students have obtained their Ph.D. (59), D.Sc. (3) and M.Sc. (4) degrees under her guidance, many of whom are occupying important positions in academia and industry in India and abroad. Many of them have developed their own research schools on Natural Products and synthetic Organic Chemistry and are playing key-roles in the development of this area in India and abroad, in colleges, research institutions, universities, industries and policy-making bodies.

Alkaloids

Professor (Mrs.) Chatterjee is well known for her research on the chemistry of indole alkaloids, a field in which she evinced keen interest since the beginning of her research career in 1938, when she started work on the chemical investigation of the alkaloids of ***Rauwolfia canescens***. Her interest in this field received further impetus while working with Professor Paul Karrer, N.L., at Zürich University (1949-1950) on the investigation of corynantheine and related compounds. On her return to India she extended her investigations to different *Rauwolfia* species and also to other genera of *Apocynaceae*. Her work on *Rauwolfia* species brought her into close association with Late Professor Dr. Salimuzzaman Siddiqui, F.R.S., former Director of Husein Ebrahim Jamal Post Graduate Institute of Chemistry, University of Karachi, Pakistan. For her contribution on *Rauwolfia* species she was invited to write two reviews: “Rauwolfia alkaloids – A. Chatterjee, *Zechmeister’s Fortschritte der Chemie Organischer Naturstoffe*, **10**, 382 (1953)”, and “Recent development in the Chemistry and Pharmacology of Rauwolfia alkaloids – A. Chatterjee, S. C. Pakrashi and G. Werner, *Zechmeister’s Fortschritte der Chemie Organischer Naturstoffe*, **13**, 346 (1956)”. Her pioneering work on the alkaloids of *Rauwolfia, Vinca, Alstonia, Rhazya* and *Kopsia* made immense impact on the researches that followed in the field of indole alkaloids both in India and abroad. Professor Chatterjee and her associates have investigated the chemistry of almost all the principal types of indole alkaloids. This included, in addition to several bis-indoles of novel structures, monomeric C_{19}-C_{20} indolic bases of the *corynantheinoid, yohimbinoid, heteroyohimbinoid, strychnos, sarpagine-ajmaline, vobasine, picraline* and *aspidosperma* types. Among her earlier work in this area mention may be made of her studies on the structure and stereochemistry of rauwolscine, the major alkaloid of *Rauwolfia canescens*. This work not only revealed the occurrence of yohimbinoid bases in *Rauwolfia* species, but also helped to elucidate the structure of other related alkaloids of the genus *Rauwolfia*. She also made notable contributions to the elucidation of the structures of ajmaline and sarpagine. The correct stereo-configuration of the latter was first suggested by her group. Her later work on *Rauwolfia reflexa* revealed the presence of a novel dimeric bis- indole alkaloid, flexicorine, in addition to other indole alkaloids of new structural patterns.

One of the most fruitful areas of her research had also been the investigation of various *Alstonia* species. More than twenty new alkaloids had been isolated from *Alstonia venenata*. Extensive studies on echitamine, a quaternary alkaloid of *Alstonia scholaris*, established the presence of a pyrrolidino-indoline moiety in the compound. Another challenging problem had been the structure elucidation of nareline, isolated from the same plant. It possessed a new skeletal pattern (indolo-2-aza-adamantane) and was biogenetically derived from the picraline-type bases. It featured a modified E-ring with a C_5-C_{12} rather than the usual N_4-C_5 bond. The exocyclic C_5 was present as an aldehyde group which formed a cyclic hemiacetal with a hydroxyl attached to N_4.

The work on *Alstonia macrophylla* was highlighted by the investigations on the chemistry of the dimeric alkaloids villalstonine, macralstonine and the structure of the monomeric O-benzoyl-vincamajine.

Her research on *Rhazya stricta* was widely acclaimed. This involved the structural studies on aspidospermine (rhazidine), sarpagine (rhazine), picraline (strictamine and rhazinaline) and tetrahydro-□-carboline (rhazinine) types. The isolation of the novel alkaloid rhazinilam from the same source was made from her laboratory.

Professor (Mrs.) Chatterjee made extensive investigations on the alkaloids of *Voacanga grandifolia*. This resulted in the isolation and structure elucidation of the bis-indole alkaloid grandifoline and a number of its congeners. The structure of grandifoline was established and was shown to possess an isovobtusine stereochemistry at the spiro-carbon, C_{14}, and an oxide bridge flanked by $C_{2'}$ and $C_{3'}$.

In connection with her work on indole alkaloids Professor (Mrs.) Chatterjee published a number of papers dealing with their biogenesis. A notable contribution in this connection was the isolation and characterisation of geissoschizine, a key precursor in the biogenesis of indole alkaloids, from *Rhazya stricta*. Another interesting observation made on *Alstonia venenata* and *Vinca major* was the isolation of venoterpine, a monoterpenoid pyridine base, whose co-occurrence with C_{19}-C_{20} indole alkaloids provided evidence in favour of the currently accepted biogenetic theory.

Professor (Mrs.) Chatterjee made significant contributions on mechanistic, stereochemical and transformation studies of a number of indole alkaloids. These included conversion of yohimbinoid alkaloids to their 3,4-secoderivatives, studies on the stereochemical course of ketone reduction in yohimbone and rauwolsone with different reagents, conformational analysis of various yohimbine isomers and novel chemical transformations of ajmaline and ajmalicine.

Synthetic studies were carried out on a number of complex indole, quinoline and isoquinoline alkaloids through novel routes. A simplified and novel procedure for the synthesis of □-phenylethanol amines in connection with alkaloid synthesis was developed by her. Synthesis of alkaloids under physiological conditions was also carried out. The syntheses of calycotomine, pseudocodanine and pseudolaudanine deserve special mention.

Professor (Mrs.) Chatterjee also studied other groups of alkaloids. She made significant contributions to the chemistry and synthesis of steroidal alkaloids, particularly on the new and interesting 5□-pregnane derivatives from *Apocynaceae* and *Buxaceae*. The structure of kashmirine, isolated from *Fritillaria roylei* (*Liliaceae*), having a C-nor-D-homo steroidal skeleton bearing a *cis* D/E ring juncture was hitherto unknown in this type of steroid alkaloids. In addition, more than half a dozen steroidal alkaloids had been isolated from *Sarcococca pruniformis* of which the structure and stereochemistry of saracocine, saracodine and saracodinine all bearing the 5□-pregnane skeleton had been established. The novel synthesis of several isoquinoline and indole alkaloids using **"diazoketone intermediates"** was developed by her. Synthetic chemists who had been frequently using the "diazoketone intermediates" for the synthesis of terpenoids were surprised at this elegant application of what they considered as **their reagent**. Of the several alkaloids synthesised by her using this intermediate, mention may be made of a few, (±)-2,3-dimethoxy berbine, (±)-norcoralydine, (±)-demethoxy carbonyl dihydrogambirtanine, (±)-17-methoxy- hexadehydroyohimbane, (±)-rauwolscine and (±)-2,3-dimethoxyhexahydroberbine. The concise synthesis of the DNA-Intercalating and antimalarial alkaloid, Cryptolepine deserves special mention. The key step in this synthesis involved the aqueous-phase base-catalysed condensation of isatin and 1-acetyl-IH-indol-3-yl acetate which was simplified and expedited by dielectric heating. The method transforms the synthesis of an important drug molecule from a prohibitively lengthy process to a matter of a few minutes with a much-improved yield.

Terpenoids

Professor Chatterjee's contributions in the field of terpenoids once again reflected her varied interest in other groups of Natural Products. More than a dozen plant species were thoroughly examined of which studies on the plants *Aphanamixis polystacha*, *Walsura tabulata* and *Cedrela toona* (all *Meliaceae*), *Zanthoxylum rhetsa* (*Rutaceae*), *Artemisia vulgaris* (*Compositae*), *Croton caudatus* (*Euphorbiaceae*) and *Callicarpa macrophylla* (*Verbenaceae*) deserve special mention. She made significant contributions on the transformation of terpenoids. Her novel work on the correlation of terpenoids of different skeleta through Lewis acid catalysed rearrangements led to a better understanding of their structural relationships. The partial synthesis of triterpenoids from readily available natural substrates through novel rearrangements once again reflected her deep understanding of mechanistic organic chemistry.

Coumarins

Coumarins are yet another group of Natural Products which bear the imprint of her outstanding contributions. A significant number of new coumarins of biogenetic interest and bearing interesting substitution patterns were isolated by her research group from Indian medicinal plants belonging to the families *Rutaceae, Umbelliferae, Compositae, Euphorbiaceae* and *Thymelacaceae*. Her research in this field began with the elucidation of the structure of luvangetin, isolated from ***Luvanga scandens***, in 1940. It was first observed by her that γ,γ-methylallyl ethers of hydroxycoumarins when subjected to the conditions of Claisen rearrangement suffered degradation to phenolic coumarins and isoprene instead of undergoing any molecular rearrangement. She had made extensive studies on the action of Lewis acids on prenylated coumarins using natural products as substrates. This resulted, not only in the synthesis of coumarins already isolated from nature, but also in the discovery of new and interesting reactions and rearrangements. In fact, several natural coumarins bearing unusual types of functionalised isopentenyl side chains could be synthesised in the course of these studies. She also developed new synthetic routes to other coumarin systems, an example being the 4-phenyl coumarins, dalbergin and nor-dalbergin.

Mechanistic and synthetic studies

Mechanistic and synthetic studies also constituted another important area of her research activity. The mechanism of the acid-catalysed hydramine fission of □-phenylethanol amines had been thoroughly investigated by her research group. It was observed for the first time during these studies that the substituents on the aromatic rings played an important role in determining the nature of the products formed and steering the course of the reaction.

She introduced the use of periodic acid as a reagent for the detection and location of terminal and exocyclic double bonds in organic compounds and was the first to show that this method was a good alternative to ozonolysis.

Professor Chatterjee made outstanding contributions to the chemistry of indoles. Her studies on the reactivity of the indole and substituted indole nuclei towards various electrophiles for two decades resulted in the discovery of new and novel reactions, correction of complex structures of products reported earlier in the literature and discovery of newer facets of the Plancher Rearrangement. Her studies have opened up a New Chapter in Indole Chemistry.

Development of Drug Formulations based on Indigenous Medicinal Plants

Professor Chatterjee's interest on plant products occurring in Phanerogam was also extended to lower lants, particularly Cryptogam. From *Marsilea minuta* (water fern) the sedative and anticonvulsant drug, marsilin, was isolated and its structure established. The pharmacological activity of marsilin had been established through decades of research and clinical trials at the **Bon Hooghly Hospital for Crippled Children** in collaboration with her doctor brother, Late Professor Sarashi Ranjan Mukherjee, M.B., M.S., Ph.D. (a Bhatnagar Awardee in Medical Sciences), former Director of Seth Sukhlal Karnani Memorial Hospital (S.S.K.M.; formerly known as Presidency General Hospital), Kolkata, and former Professor and **Founder-Directo**r, Department of Experimental and Nuclear Medicine, Post-Graduate Institute of Medical Education and Research (PGIMR), S.S.K.M. Hospital. Marsilin has been found to be effective in the treatment of epilepsy and in curing behavioural epileptic disorders. It is now being used as a highly successful rehabilitation drug in combination with *Nardostachys jatamansi* under the code-name Ayush 56 (patented in1976). The anti-malarial drug, coded Ayush 64, is yet another successful drug developed by Professor (Mrs.) Chatterjee (patented in 1979). This is a combination of different parts of four plants Chirata (*Swertia chirayata)*, Chhatim/ Saptaparni (*Alstonia scholaris)*, Kuberakshi (*Caesalpinia indica*), Katuka (*Picrorhiza kurroa)*. Both these *combination-drugs* have been patented by the CCRAS (under Ministry of Health and Family Welfare), Government of India. The patents have been purchased by the National Research Development Corporation, Government of India, and the drugs are being marketed by several companies and also exported. The discoveries of these two *combination-drugs* are landmarks in developing ***"alternate lines of treatment"*** leaving no side effects.

Since the beginning of her teaching and research profession she had dreamt of establishing an Institute for carrying out research on Indian Medicinal Plants, developing new Ayurvedic formulations and of building an Ayurvedic hospital for the people of West Bengal. She took the initiative to found a multi-disciplinary Research Institute at Bidhannagar. This was the Regional Research Institute (Ay), now upgraded to the Central Ayurveda Research Institute under the direct administration of the recently formed Ministry of Ayush, Government of India. Professor Chatterjee served as Honorary Principal Coordinator for many years. This Institute has in addition to the Ayurvedic Hospital, a Pharmacy for producing drug formulations, and sections for carrying out research on Chemistry, Pharmacognosy and Botany, Biochemistry and Pharmacology of drugs derived from Indian Medicinal Plants. Ayurvedic formulations are developed and clinical trials are systematically carried out and the drugs are sent to different parts of India. With support from the Ministry of Ayush, extensive expansion of facilities are being made, and a new 8-storey building has been constructed.

Author and Editor of Books

At the request of Late Professor Satyendra Nath Bose, F.R.S., she wrote in Bengali *Madhyamic Rasayan Vidya*, a book on Chemistry in two volumes for secondary school students, published by *Bangiya Bijnan Parishad*, an Institute for the Popularisation of Science founded by the renowned scientist himself. She had edited and rewritten *Bharater Bonousadhi*, a treatise in Bengali on Indian Medicinal Plants in six volumes (Volumes 1-5; 1973; Volume 6; 1977) (originally compiled by Late Dr. K.P. Biswas in 2 volumes) and published by Calcutta University. As an author/ principal-editor she has compiled in English ***The Treatise on Indian Medicinal Plants*** published in six volumes earlier by Publication and Information Directorate, C.S.I.R., then by National Institute of Science Communication, C.S.I.R. and later by the National Institute of Science Communication and Information Resources, C.S.I.R. – (Volume 1 – First Edition : 1991; Reprinted : 1994, 1997; Revised and Updated Edition : 2005; Volume 2 – First Edition : 1992; Reprinted 1995; Revised and Updated Edition : 2006; Volume 3 – First Edition : 1994; Reprinted : 2003; Revised : 2006; Volume 4 – First Edition : 1995; Reprinted : 2003; Volume 5 – First Edition : 1997; Reprinted : 2003; Volume 6 – First Edition : 2001).

Popularisation of Science

She was also deeply involved in the Popularisation of Science through Bengali language. She was closely associated with Professor Satyendranath Bose, FRS, who established the *Bangiya Bijnan Parishad*. On the demise of Professor Bose in 1974, Professor Chatterjee took up the helm of the Parishad as its second President. She helped in the construction of the building of the Parishad and also obtained funds from the West Bengal Government for Experimental Science – the *'Hatey Kalamey' Bibhag.* She was active for the education and upliftment of women and was the President of the *'Nari Siksha Mandir' school.*

Awards and Honours

Professor Chatterjee was elected a Fellow of the National Institute of Sciences of India (now known as Indian National Science Academy) (1960), was awarded the Shanti Swarup Bhatnagar Award, CSIR (India) (1961), Sir P.C. Ray Award of the Indian Chemical Society (1974), elected General President of the 62nd Session of the Indian Science Congress, New Delhi (1975), elected "Woman of the Year" by the Ladies Study Circle, Chamber of Commerce (1974) in International Women's Year, received ~~the~~ D.Sc. Degree (honoris causa): University of Burdwan (1976), Benaras Hindu University (1982), University of Kalyani (1999), the Vidyasagar University (2006), honoured with "Padma Bhusan" by the Government of India (1975), received the Bhuban Mohini Das Gold Medal, by the University of Calcutta, for the best contribution in Bengali for compiling in six volumes "Bharater Banausadhi" (1981), was nominated by the President of India as a Member of Parliament (Rajya Sabha) as a Scientist- Academician (February 1982-84; May 1984 - May 1990), was Leader of the Indian Delegation to the VIIth Indo-Soviet Symposium on Natural Products (1983), received the Sisirkumar Mitra Lectureship of the Indian National Science Academy (1984; lecture delivered in 1985), received Sir C.V. Raman Award of the Hari Om Ashram Trust by the University Grants Commission (1982, awarded in 1985), Professor P.K. Bose Award of the Indian Chemical Society (1988; lecture delivered in 1991), was honoured by the Indian Science Congress in the Platinum Jubilee Celebration, Pune (1988), received Sir Asutosh Mukherjee Memorial Gold Medal, the most prestigious award of the Indian Science Congress Association (1989), the first Goyal Prize and Gold Medal in Chemical Sciences of the Goyal Foundation, University of Kurukshetra (1992), the Dr. G.P. Chatterjee Lectureship of the Indian Science Congress Association (1994), the Indira Gandhi Priyadarshini Award of the All India Unit Conference (1994), the Silver Jubilee Award of the Central Council for Research in Ayurveda and Siddha, Government of India (1995), the Eminent Teacher Award by the University of Calcutta (1997), the Rathindra Award of Visva-Bharati (1997), honoured by the West Bengal Academy of Science and Technology and awarded the Academy Medal (1998), awarded the special title "Bijnan Bharati" on the 175th Anniversary of the Sanskrit College, Kolkata (1999), honoured by the Indian Chemical Society in the Platinum Jubilee Celebration in recognition of her life-time achievements in Promoting the Standard of Organic Chemistry Research in India (1999), received Sir Devaprasad Sarbadhikary Gold Medal, the most prestigious award of the University of Calcutta (1999) for her Contributions to Science and the P. C. Chandra Purashkar of the P. C. Chandra Group for her contributions to

Science (2001).

A week before she slipped into coma, the then Mayor of Kolkata, Hon’ble Shri Bikash Ranjan Bhattacharyya, visited her at her residence and conferred on her the award of “HONOURED” citizen of Kolkata (2006).

A Person to be Remembered

Her rise to her present eminence had been possible due to her sincere devotion to duty, hard work and unquenched thirst for knowledge. She had been learning throughout her life and she never hesitated to learn even from her students. A true “Karma Yogi” as she was, she believed in carrying out her duties and her responsibilities without aspiring for the results and rewards. She was passionately devoted to the ideals of Shri Ramakrishna and Holy Mother Sarada and had ardent faith in the philosophy of Swami Vivekananda. It was possibly this *selfless devotion* which refrained her from accepting any royalties for the development of drugs, for books written or for accepting fees from Bengal Chemical and Pharmaceutical Works Ltd., Kolkata, for the still “well-known legal battle” of 1968 at the Calcutta High Court.

Her life was and will always remain as a unique example of commitment and harmony between the professional and her private life. By her grace, she had made herself adorable to all her students and acquaintances. Professor Chatterjee was a very good human being steeped in Indian Culture. She inspired and encouraged a legion of students in the active pursuit of teaching and research. She nurtured a well-recognized School of Chemistry of Natural Products. Her record of achievements, her idealism, devoted commitment to the teaching vocation and total dedication to work were exemplary and had added lustre to the glorious heritage of the University of Calcutta, the pioneer and great seat of learning. Her simplicity and affability, warmth and boundless love had won her a permanent place in the hearts of those who ever came in contact with her. Her students reverentially called her “Master” (teacher), her younger contemporaries “Didi” (elder sister) and others “Ma” (mother). Late Dr. Madhuri R. Shah, Former Chairman, University Grants Commission, in one of her letters to Professor Chatterjee’s daughter wrote “Her selfless devotion inspires and gives strength to people like me and renews my faith and the goodness of human nature”.

Professor Asima Chatterjee Foundation, Kolkata

The genesis of the Professor Asima Chatterjee Foundation goes back to 1997, when a Committee was formed for the observance of her 80th Birthday in September 1997. A three-day Conference was organised at Science City in which participants came from Academia, Industry, and Public Life. Professor Chatterjee was also felicitated at the Science College campus, in the Meghnad Saha auditorium later in the same month in a function organised by the Chemistry Department, Calcutta University. This Committee, with Dr. S. C. Pakrashi as President, continued its activities after 1997.

After the sad demise of Professor Chatterjee in 2006, the students and admirers of Professor Chatterjee gave shape to this Committee as a registered Foundation – the Professor Asima Chatterjee Foundation, Kolkata was established with a view to perpetuate her memory and to inspire future generations for the upliftment of the status of chemical research and education in India. Dr. Pakrashi was the first President of PACFK, with Prof. Biswapati Mukherjee as its Honorary Secretary.

From 2015, the PACFK has been arranging the Professor Asima Chatterjee Oration Lecture on her Birth Anniversary on or about 23rd September. Ten Oration lectures have been given till 2024 by Dr. A. V. Rama Rao, Professor Goverdhan Mehta, Dr. Ganesh Pandey, Dr. K. N. Ganesh, Professor Tushar Chakrabarty, Professor J.S. Yadav, Professor C. S. Mathela, Professor Shital Chattopadhyay, Professor Uday Maitra, and Professor Amitava Das. The Foundation organised two **International Conferences on Chemistry for Human Development** (**ICCHD**) with the collaboration of The University of Calcutta and Heritage Foundation in January 2018, and January 2020. Many famous scientists drawn from Academia and Industry in India, and several Asian, European and American countries participated. Due to the COVID pandemic, there was a gap of five years - the third is being held now - ICCHD2025.

On September 23rd 2017 Google celebrated her 100th birthday with a special doodle tribute to her. On 8th November, India Post issued a commemorative postage stamp on Indian Council of Medical Research; the India Post write-up accompanying the release of this stamp was as follows: Asima Chatterjee was an Indian chemist noted for her work in the fields of organic chemistry and phytomedicine. She is the first Indian woman to be awarded a D.Sc. for science for her work in medicinal chemistry. The Government of India announced the creation of eleven chairs in the names of Indian Women scientists, February 2020 - Professor Asima Chatterjee’s name figured among these illustrious names.

Recent Accolades

It would be relevant to mention certain other accolades given to Professor Chatterjee in recent years. On 23rd September 2017, Google celebrated her 100th birthday with a special doodle tribute to her. In a book brought out by Vigyan Prasar entitled ‘Indian Scientists: The Saga of Inspired Minds” a Chapter has been devoted to her. A plenary Session entitled ‘Investigations of Indian Medicinal Plants - *A Post-Centenary Tribute to Professor (Mrs.) Asima Chatterjee* - was organised at the 107th Session of the Indian Science Congress Association at Bangalore in 2020. In recent years the Asiatic Society, Lady Brabourne College and Scottish Church College have organised Seminars on the life and work of Professor Chatterjee. The Indian Chemical Society organised an on-line Session on Professor Chatterjee at their Annual Convention in 2021. Two lectures were given by Professor Julie Banerji in Seminars organised by the IIT, Indore, and WIEE. A Chemistry Building in IIT, Jodhpur has been named after Professor Chatterjee. Very recently, information was received that an Auditorium at DST Headquarters and also at IISER, Kolkata have been named after her.

The Science City Museum has done a course correction to rectify a gender bias at Science Centres across the country by showcasing ten remarkable women scientists, whose achievements are no less than their illustrious male counterparts who have been in the spotlight thus far. The National Council of Science Museums (NCSM) that manages all the Science Centres in the country unveiled busts of 10 Pioneering women scientists - Kadambini Ganguly (Medicine), Bibha Chaudhuri (Physicist), Asima Chatterjee and Darshan Ranganathan (Chemists), Janaki Ammal (Botanist), Irawati Karve (Sociologist and Anthropologist), Kamal Jayasingh (Biomedical Research), Anna Marie (Physicist and Meteorologist), Rajeswari Chatterjee (Engineer) and Archana Sharma (Botanist) at Science City during the International Museum Expo in May, 2024. The Birla Industrial and Technology Museum (under the National Council of Science Museums) honoured these ten scientists by installing their busts in December 2024. In addition, Professor Chatterjee’s Early Life and Education, Family Background, Professional Career, Notable Scientific Contributions, Important Research Publications, Awards and Honours, Establishment of Central Ayurveda Research Institute and Hospital at Bidhannagar with pictorial illustrations have been installed in the Video gallery along with several other scientists in December, 2024 which was formally opened by the Governor of West Bengal, His Excellency C. V. Ananda Bose in December, 2024.

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List of Review Articles Published by Professor (Mrs.) A. Chatterjee

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4. Recent development in the chemistry and pharmacology of *Rauwolfia* alkaloids – A. Chatterjee, S. C. Pakrashi and G. Werner, *Zechmeister's Fortschritte der Chemie Organischer Naturestoffe*, **13**, 346 (1956).
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20. An overview of the genus Nardostachys – (Late) (Mrs.) A. Chatterjee, U. Datta, D. Bandyopadhyay, A. Nayak, B. Basak, A. Banerji and J. Banerji, *Natural Products Communications*, **2**, 1163 (2007)

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1. *Madhyamik Rasayan Vidya*, (for Secondary School Students) Volumes 1 and 2, Published by Bangiya Bignan Parishad (1960).
2. *Bharater Banausadhi*, Calcutta University (Originally 2 Volumes) by Dr. K. P. Biswas) Re- edited, Revised and Enlarged, Volumes 1-5 (1973), Volume 6 (1977).
3. *Treatise on Indian Medicinal Plants* published in six volumes earlier by Publication and Information Directorate, C.S.I.R., then by National Institute of Science Communication, C.S.I.R. and later by the National Institute of Science Communication and Information Resources, C.S.I.R. – (Volume 1 – First Edition: 1991 ; Reprinted : 1994, 1997; Revised and Updated Edition: 2005; Volume 2 – First Edition: 1992; Reprinted 1995; Revised and Updated Edition: 2006; Volume 3 – First Edition: 1994; Reprinted: 2003; Revised and Updated Edition: 2006; Volume 4 – First Edition: 1995; Reprinted: 2003; Volume 5 – First Edition: 1997; Reprinted: 2003; Volume 6 – First Edition: 2001

Endowment Lectures by Professor (Mrs.) Asima Chatterjee

1. Khudiram Bose Memorial Lecture (1962) – Calcutta University
2. Hiran Kumar Basu Memorial Lecture (1973) – Calcutta University
3. Sir P. C. Ray Memorial Lecture (1974) – Indian Chemical Society
4. Foundation Day Oration (1974)- University College of Science, Calcutta University
5. Ashoke Bikash Bhattacharyya Memorial Lecture (1976) – Calcutta University
6. Manmatha Basu Memorial Lecture (1976) – Calcutta University
7. 40th Acharya Jagadish Chandra Bose Memorial Lecture (1978) – Bose Institute
8. First Professor Harinarayan Khastgir Memorial Lecture (1979) – University of North Bengal
9. Subodh Mitra Memorial Lecture (1980) – Chittaranjan Cancer Research Institute, Kolkata
10. Convocation Address, (1982) – Indian Institute of Technology, Kanpur
11. Professor T. R. Seshadri Memorial Lecture (1983) – Delhi University
12. Convocation Address (1984) – University of North Bengal
13. Shri Santanu Ghosh Memorial Lecture (1987) – Indian Science News Association
14. Professor P. K. Bose Memorial Lecture (1991) – Indian Chemical Society
15. Professor S. K. Mukherjee 65th. Birthday Commemoration Lecture (1993) – Agricultural Society of India
16. Dr. G. P. Chatterjee Award Lecture (1994) – Indian Science Congress Association
17. Fourth Oration Lecture (1997) – West Bengal Academy of Science and Technology

Awards and Honours

1. Elected Fellow of the National Institute of Sciences of India (now known as the Indian National Science Academy) – 1960
2. Shanti Swarup Bhatnagar Award, CSIR (India) – 1961
3. Sir P. C. Ray Award of the Indian Chemical Society – 1974
4. Honoured on the 60th Anniversary of the University College of Science, Calcutta University, Foundation Day – 1974
5. Honoured as Woman of the Year (in connection with the International Womens' Year) by the Ladies Circle, Chamber of Commerce, and received the medal – 1974
6. Elected General President of the 62nd Session of the Indian Science Congress (held at New Delhi) – 1975
7. Fellow of the Indian Science Academy - Bangalore - 1976
8. Received D. Sc. Degree (honoris causa), University of Burdwan – 1976
9. Received D. Sc. Degree (honoris caua), Benaras Hindu University – 1982
10. Received D. Sc. Degree (honoris causa), University of Kalyani – 1999
11. Received D. Sc. Degree (honoris causa), Vidyasagar University – 2006
12. Honoured with Padma Bhusan, Government of India – 1975
13. Subodh Mitra Memorial Oration Medal, Chittaranjan National Cancer Research Centre, Kolkata – 1979
14. Bhuban Mohini Das Gold Medal of the University of Calcutta – 1981
15. Nominated by the President of India as a Member of Parliament (Rajya Sabha) as a Scientist – Academician –

February 1982-84; May 1984-90

16. Nominated as leader of the Indian Delegation by the Indian National Science Academy to the VIIth Indo – Soviet Symposium on Natural Products held at Tbilsi (Georgia) – 1983
17. Sisir Kumar Mitra Lectureship of the Indian National Science Academy – 1984
18. Received Sir C. V. Raman Award of the Hari Om Trust of the University Grants Commission for 1982 – 1985
19. Professor P. K. Bose Lectureship and Oration Medal of the Indian Chemical Society – 1988.
20. Honoured by the Indian Science Congress in the Platinum Jubilee Celebration, Pune – 1988
21. Sri Asutosh Mookherjee Gold Medal of the Indian Science Congress Association – 1989
22. First Goyal Prize and Gold Medal in Chemical Sciences of the Goyal Foundation, University of Kurukshetra – 1992
23. Honoured by the Information and Cultural Ministry, Government of West Bengal, for Life Time Achievement during the completion of the Bengali New Year (1400) – 1994
24. Dr. G. P. Chatterjee Lectureship of the Indian Science Congress Association – 1994
25. Indira Gandhi Priyadarshini Award of the All India Unit Conference – 1994
26. Silver Jubilee Award of the Central Council for Research in Ayurveda and Siddha, Government of India – 1995
27. Eminent Teacher Award of the University of Calcutta – 1997
28. Rathindra Purashkar of Visva Bharati – 1997
29. Honoured by the West Bengal Academy of Science and Technology and awarded the Academy Medal – 1998
30. Awarded the Special Title of "Bijnan Bharati" on the 175th Anniversary of the Sanskrit College, Kolkata – 1999
31. Sir Devaprasad Sarbadhikary Gold Medal, University of Calcutta – 1999
32. Honoured by the Indian Chemical Society in the Platinum Jubilee Celebration in Promoting the Standard of Organic Chemistry Research in India – 1999
33. P. C. Chandra Purashkar of the P. C. Chandra Group for Contribution to Science – 2001
34. Honoured Citizen of Calcutta Award by the First Citizen of Calcutta, the then Mayor of Calcutta, Hon'ble Sri Bikash Ranjan Bhattacharyya – 2006

RESEARCH ASSOCIATES OF PROFESSOR (MRS.) ASIMA CHATTERJEE

Awarded D.Sc. Degree of the University of Calcutta

1. Late Anil Bhattacharyya 1956
Reader, Department of Chemistry, Calcutta University
2. Late Sukumar Bose 1956
Professor, National Sugar Institute, Kanpur
3. Mrs. Bani Talapatra 1962
Former Professor and Head, Department of Chemistry, Calcutta University

Students Awarded Ph.D. Degree of the University of Calcutta

1. Late Subhendu Ghosh Majumder 1953
Professor, Department of Chemistry, Burdwan University
2. Late Satyesh Chandra Pakrashi 1954
Former INSA Fellow, Department of Pharmacology,
University College of Medicine, Calcutta University and Former Director,
Indian Institute of Chemical Biology, Kolkata
Former General President, Indian Science Congress Association
3. Tarakeswar Chakrabarty 1955
Former Professor of Chemistry, Presidency College, Kolkata
4. Late Mrs. Anima Bhattacharyya 1955
Reader, Department of Chemistry, Bethune College
5. Sunil Kumar Talapatra 1957
Former Professor and Head, Department of Chemistry, Calcutta University

	Former President, Indian Chemical Society	
6.	Late Sudhir Kumar Srimany Reader, Department of Chemistry, Bengal Engineering College (IIEST)	1958
7.	Late Sunil Kumar Ray USA	1959
8.	Chandrachur Ghosh Former Reader in Chemistry, Bangabasi College, Kolkata	1959
9.	Late Narayan Adityachaudhury Professor, Bidhan Chandra Krishi Viswavidyalaya, Haringhata	1960
10.	Late Sibnath Ghosal Former Professor of Pharmaceutical Chemistry, Benaras Hindu University, Varanasi	1960
11.	Late Bhupesh Ch. Das Institute de Chimie des, Subtances Naturelles 91190 GiF-Sur-Yvette, France	1960
12.	Late Sudhir Kumar Saha Reader, Presidency College, Kolkata	1961
13.	Late Saral Nath Ghosh Lecturer, Anandamohan College	1962
14.	Chiraranjan Ghosal Former Professor of Chemistry, Jadavpur University, Kolkata	1963
15.	Late Santiranjan Bhattacharyya Professor, Departmental of Chemistry, Presidency College	1964
16.	Rabindranath Mukherjee Formerly of Faculty De Pharmacia, Universidade Federal do Rio Grande do sul, Porto Alegre, RS Brazil	1964
17.	Gouranga Ganguly USA	1964
18.	Late Anil Bandhu Ray Professor, Department of Medicinal Chemistry, Benaras Hindu University, Varanasi	1965
19.	Chandi Prosad Dutta Former Professor of Chemistry, Kalyani University, Kalyani, Nadia	1965
20.	Late Priyalal Majumdar Professor of Chemistry, Calcutta University	1966
21.	Mrs. Sabita Dutta Former Reader, Dept. of Home Science, Calcutta University	1966
22.	Samar Kumar Kundu USA	1966
23.	Kali Sankar Mukherjee Former Professor of Chemistry, Viswa Bharati University, Santiniketan.	1966
24.	Late Biswapati Mukherjee Professor and Head, Department of Pharmacology, Calcutta University and Former Director and Professor of S. N. Pradhan Centre for Neuroscience, Calcutta University	1967
25.	Late Mrs. Mandira Banerjee	1968
26.	Mrs. Rekha Majumder Former Reader in Chemistry, Lady Brabourne College, Kolkata	1968
27	Late Mrs. Sibani Chakraborty Reader, Department of Home Science, Calcutta University, Kolkata	1968
28.	Sudam Chandra Base Former CSIR Senior Scientist, Gr. VI, Regional Research Laboratory, Bhubaneswar	1968
29.	Late Amit Baran Kundu Former Scientist, II, Chemistry, NRIADD uner CCRAS, Govt. of India, Kolkata.	1968
30.	Avijit Banerji Former Professor and Head, Department of Chemistry, Calcutta University and former Sir Asutosh Mookerjee Fellow (ISCA-DST).	1970

	Former General Secretary, Treasurer, Sectional President – Chemical Sciences; Indian Science Congress Association	
31.	Gopal Chandra Biswas Former Research officer, CCRAS	1970
32.	Mrs. Bani Chandra	1970
33.	Mrs. Julie Banerji Former Khaira Professor and Head, Department of Chemistry, Calcutta University, Former Secretary, Indian Science News Association	1972
34.	Mrs. Dhira Ganguly Former Professor, Department of Home Science, Calcutta University	1972
35.	Late Satya Kinkar Desmukh Former Joint Director, Ordinance Factory Staff College, Ambajhari, Nagpur	1972
36.	Gobinda Chandra Sengupta Former Reader in Chemistry, Krishnanagar Govt. College, Krishnanagar, Nadia.	1973
37.	Asis Mukhopadhyay Institute of Science and Technology, Hatisur Campus, Dharan, Nepal	1973
38.	Rabindranath Rej USA	1974
39.	Manas Chakrabarty Former Professor of Chemistry, Bose Institute, Kolkata	1974
40.	Mrs. Rajashree Sen USA	
41.	Debasis Malakar USA	1976
42.	Kali Prasanna Dhara Former Reader, Department of Chemistry, Calcutta University	1978
43.	Asoke Banerjee Independent Director, Kores (India) Ltd, Mumbai	1978
44.	Asim Ghosh USA	1979
45.	Late Sibabrata Mukhopadhyay Scientist, Indian Institute of Chemical Biology, Kolkata	1979
46.	Sudipta Bhattacharyya Scientist, EIPW Ltd., Kolkata	1980
47.	Mrs. Kumudini Padhi Hyderabad	1980
48.	Mrs. Suvra Mandal Former Assistant Director, Chemistry, NRIADD, now CARI under CCRAS, Govt. of India, Kolkata	1981
49.	Sankar Saha USA	1981
50.	Somnath Ghosh Former Professor of Chemistry, Jadavpur University and Former Vice-Chancellor, North Bengal University, Siliguri	1982
51.	Dhrubajyoti Roy Former Reader, Department of Chemistry, Palpara College, Palpara, Midnapore	1983
52.	Suchitra Ghosh USA	1983
53.	Late Biswanath Das Former Scientist, Indian Institute of Chemical Technology, Hyderabad	1985
54.	Late Tapanjyoti Bhaumik Former RA, Department of Chemistry, NARADD, now CARI under CCRAS, Government of India	1986
55.	Uttam Kr. Pandit Former Chemist, National Test House, Kolkata	1986

56. Mrs. Lila Nayak 1986
Former Reader in Chemistry, Kamarpukar College, Hooghly
57. Arabinda Sahu 1993

Student Awarded Ph.D. Degree of University of Agra, U.P.

58. P. C. Joshi 1992
Former Research Officer, Indian Institute of Drug Research,
CCRAS, Govt. of India Tarikhat, Almora

Student Awarded Ph.D. Degree of the University of Guwahati, Assam

59. Jeevan Kotoky 1986
Former Professor, Division of Life Science, Medicinal and Economic Plant Section, ‘
Institute of Advanced Study in Science and Technology, Jawahar Nagar,
Khanapara, Guwahati

Students Who Did M.Sc. Thesis

1. Late Sudhangsu Sekhar Mitra 1943
2. Late Hari Narayan Khastigir 1946
Professor, North Bengal University
3. Late Anil Bhattacharya 1950
Reader, Department of Chemistry, Calcutta University
4. Late Mrs. Anima Bhattacharyya 1951
Reader, Department of Chemistry, Bethune College

Former and Present Research Associates

1. Late Professor Sarashi Ranjan Mukherjee
Former Director, SSKM, Kolkata, Founder Director, Director of Nuclear Medicine, PGIMER, SSKM
2. Late Dr. K. L. Handa
RRL, Jammu
3. Prof. O. P. Mittal
Former Professor of Pharmacy, BIIT, Pilani, Rajasthan
4. Late Mr. Parimal Ghosh
Former Lecturer, St. Xavier’s College, Kolkata
5. Mr. Jyotirmay Mitra
Former Reader in Chemistry, Vivekananda College, Kolkata
6. Late Dr. Ramprasad Bhattacharyya
Former Reader, St. Paul’s College, Kolkata
7. Late Mrs. Latika Ghosh
8. Mr. Birendra Nath Ghosh
Formerly of Institute of Jute Technology, Kolkata
9. Late Aparna Deb
Research Scholar, Department of Chemistry, Calcutta University
Dr. D. R. Gupta
10. Late Professor Basudev Prasad Das
Former Professor, Rabindra Bharati University, Santiniketan
11. Late Mr. Romesh Biswas
Scientist, Botanical Survey of India
12. Dr. S. Chandrasekharan
13. Professor S. P. Hiremath
14. Dr. Chunilal Kirtaniya
Former Principal, Mahadevananda College, Barrackpore-742 101, N 24-Parganas
15. Dr. Lala Prabir Kumar Roy
Former Director, Cinchona Factory, Mongpoo, Dist. Darjeeling
16. Professor Krishna Chandra Majumder
Former Professor of Chemistry, Kalyani University, Kalyani, Nadia

17. Late Dr. Phakir Chandra Ghosh
    Former Senior Chemist, State Water Investigation Directorate, Sech Bhavan, Kolkata
18. Late Professor Keshetra Mohan Biswas
    Former Professor and Head, Department of Chemistry, Calcutta University
19. Professor A. Patra
    Former Professor and Head, Department of Chemistry, Calcutta University
20. Dr. Ramanuj Goswami
    USA
21. Dr. Kartik Chattopadhyay
22. Mr. Abhijit Bose
23. Dr. Swapan Bhaduri
    Former of Jute Technological Research Institute, Kolkata
24. Dr. J. C. Chaudhury
    Former of Defence Laboratory, Jodhpur, Rajasthan
25. Dr. (Mrs.) Sutapa Debkirtaniya
    Former Principal, Vidyasagar College for Women, Kolkata
26. Late Dr. G. Karmakar
    Assistant Director, Hygine Institute, Kolkata
27. Dr. V. P. Arya
28. Late Dr. (Mrs.) Chitralekha Mukherjee
    Department of Physiology, Calcutta University
29. Late Professor Chandi Das Dey
    Department of Physiology, Surendra Nath College
30. Late Professor B. N. Koley
    Professor, Department of Physiology, Calcutta University
31. Professor Prasanta Kr. Dey
    Former Professor of Physiology, Benaras Hindu University, Varanasi
32. Dr. (Mrs.) Purnima Adhikary
    Former UGC House-Wife Research Associate, Department of Chemistry, Calcutta University
33. Dr. Bidyut Basak
    Former, RA, ICMR, Department of Chemistry, Calcutta University
34. Dr. (Mrs.) Munmun Saha
    Former Reader in Chemistry, Annanda Mohan College, Kolkata
35. Late Dr. P. C. Das
    Former Scientist I, Chemistry, NRIADD under (CCRAS) now CARI, Govt. of India, Kolkata
36. Dr. Bikash Barik
    Former Scientist I, NRIADD under (CCRAS) now CARI, Govt. of India, Kolkata
37. Late Dr. Asish Kumar Dey
    ARO, Chemistry, NRIADD, under CCRAS, Now CARI, Government of India
38. Mr. B. Mallik
    Former Scientist III, NRIADD under CCRAS, Govt. of India, Kolkata
39. Mr. D. N. Mandal
    Former Scientist II, NRIADD under CCRAS, Now CARI Govt. of India, Kolkata
40. Professor K. K. Das
    Former Professor, Department of Chemistry, Dibrugarh University Assam
41. Dr. Amit Krishna De
    Former Executive Secretary, ISCA

Note: RRI, NRIADD, CARIDD all refer to the same Research Institute, now named Central Ayurveda Research Institute, under the Central Council of Ayurvedic Sciences, Ministry of Ayush, Government of India. For former scientists working in this Institute, the Institute designation at their point of retirement is given

SIXTY-SECOND ANNUAL SESSION OF THE INDIAN SCIENCE CONGRESS DELHI, 1975

Professor (Mrs.) A. Chatterjee was the first woman scientist to be the General President of the INDIAN SCIENCE CONGRESS. She presided over its Sixty Second Annual Session held in Delhi in 1975 January. She delivered her Presidential Address on 3rd January at the Inaugural Function, which was attended by the then Prime-Minister (Mrs.) Indira Gandhi.

The General Presidential Address was entitled **'SCIENCE AND TECHNOLOGY IN INDIA: PRESENT AND FUTURE'** - the Focal theme for this Session.

Addressing the august gathering, Professor Chatterjee expressed her gratitude to Prime Minister Shrimati Indira Gandhi, who honored the Indian Science Congress by her presence and for delivering her inspiring Inaugural Address.

Professor Chatterjee paid rich tributes to India's first Prime Minister Shri Jawaharlal Nehru, who had laid the foundation of scientific development in independent India. Prime Minister Nehru was the General President of the Indian Science Congress Association on the eve of Indian independence. In his Presidential address delivered in the Session held at Delhi in January 1947 he emphasized the need of establishing research facilities for peaceful use of atomic energy. Prime Minister Nehru delivered his last Inaugural Address at the previous Delhi Session of the Science Congress held in October, 1963, before he passed away in following May. She quoted his remarks at this Science Congress Session about the role of Indian Scientists. He had said that scientists in India have a double role to play - they should contribute on the one hand to general development and thinking in the world, and on the other contribute to solving problems of the country. He emphasized the role of scientists to build a free and self-reliant India.

She mentioned that under the inspiring leadership of Jawaharlal Nehru, the Indian Parliament adopted a Scientific Policy Resolution in 1958 for developing science and technology. Earlier, the Government of India had set up national laboratories, technological institutes, organisations to develop R and D, had increased research facilities at universities and also set up new universities and IITs, thus adopting measures to provide firm infra-structure for advancement in science and technology.

Since Prime Minister Nehru's time, the Inaugural Session of the Science Congress has been addressed by the Prime Minister of India, reflecting the deep commitment of the Government to the development of Science and Technology in the nationwide endeavour to achieve self-reliance. Prime Minister Shri Narendra Modi and before him Dr. Manmohan Singh have upheld this tradition.

Highlights of Professor Chatterjee's Presidential Address are given below, with the sub-headings that appeared in the printed version of her address. Her address revealed that she saw deep into the future - much of what she presented then has great relevance even today, half a century later.

Science and Technology vis-a-vis our Problems

She mentioned that the National Committee of Science and Technology (NCST) had been founded by the Government of India to coordinate the activities of all the research organisations - Council of Scientific and Industrial Research, University Grants Commission (UGC), Indian Council of Medical Research, Indian Council of Agricultural Research, Atomic Energy Commission, Defence and Development Organisation, Electronics Commission and Department of Space as well as other leading research organisations to implement National Policy decisions and steer research in proper direction to meet the immediate needs of our country of 563 million population.

Scientific way of Thinking

University, the Barometer of Science and Technology

She said that in a developing country like India the strengthening of the Universities is of paramount importance. She also mentioned that emphasis has to be placed also on applied research. She considered the **University as the Barometer of Science and Technology.** The university constitutes the platform from where younger talents took their final training. She referred to the famous conversation between the scientist Michael Faraday and Mr. Gladstone, when Faraday demonstrated his famous experiment on electro-magnetism. Mr. Gladstone had asked "After all, of what use is it?" Faraday gave his prophetic reply "There is every chance that you would soon be able to impose a tax on it".

University Training (Teaching and Research)

Employment of Science Graduates

Need for Technicians

Return on Investment

She mentioned about the return on the fairly large investment made by India in science and technology since Independence. She pointed out that the appropriateness of people's doubt on the results of investment was self-evident. She mentioned that there was no dearth of talents or lack of endeavors on the part of researchers. Hence if the results were not up to expectations, these could be traced to some deficiency in the organizations where they served. She said that this would call for deeper study with a view to setting things right.

Research Areas to be further developed and Utilization of Natural Resources

Speaking as an organic chemist she mentioned that Pharmaceutical and Drug research had two main aspects to which future financial assistance need be given: (1) Research on basic problems involving the biochemistry and the mechanism of drug action, and (2) Research directly oriented towards the discovery and development of new drugs. She suggested that the research and development in following areas be prioritized -

- Mechanism of drug action,
- Physico-chemical aspects of formulation,
- Quantitative studies of structure-action relationship,
- Research on biologically active substances from the plant and animal kingdom,
- Transport, turnover and metabolism of drugs,
- Development of drug delivery systems,
- **Discovery and development of new drugs -**
  - Anti-cancer and anti-microbial agents, drugs for deficiency diseases,
  - New anti-fertility agents and devices,
  - Anti-helminthic, anti-protozoal, anti-leprotic and anti-viral agents,
  - Drugs to address collagen and connective tissue disorders, arthritic conditions,
  - Drugs to address Senile dementia and mental ill-health.

She mentioned that in 1928 Professor Simonsen in course of his Presidential Address at the Indian Science Congress ‘suggested that the chemists of India should study more intensively the wealth of natural materials that lay at their doors and devote less time to the study of problems of only theoretical interest’. She expressed satisfaction that within four and a half decades since then significant investigations ‘have embraced the isolation, the determination of the constitution, and in some cases, the synthesis of a large variety of terpenoids, various heterocycles, including alkaloids. glucosides, cardenolides, plant coloring matters and antibiotics’, their commercial utilization and their chemical transformation into useful products.

She mentioned that efforts should be made for extensive development in chemical engineering and industry ranging from giant petro-chemical and fertilizer complexes to small sector industries, and those developing downstream products - a variety of chemicals used in the polymers, dyes, agricultural and pharmaceutical industries.

Power Development

She emphasized the need for Development of Alternative Sources of Energy, as she voiced the apprehension that coal and oil resources may be exhausted in future. She opined that alternative source of energy like solar, wind, tidal and geo-thermal will have to be assessed.

Science and Humanism

She asserted that ‘all efforts to develop science and technology will be futile if human implications of science are not given due consideration’.

She concluded with the song of Tagore.

"Where knowledge is free;
Where the world has not been broken up
into fragments by narrow domestic walls;
Where words come out from the depth of truth;
Where tireless striving stretches its
arms towards perfection;
Where the clear stream of reason has not lost its way
Into the dreary desert sand of dead habit
Unto that Heaven of Freedom,
my Father, let my country awake".

‘May we all join in this quest for such a Heaven of Truth and Freedom’.

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Ph: 011 47532108
Mob: 9899335480/9868864853
E-mail: tuhin1.omega@gmail.com
tuhin1159@gmail.com

REGISTERED & HEAD OFFICE
4 RIPON STREET KOLKATA – 700 016,
WEST BENGAL, INDIA
Ph. NO. 033 2229 9839/5019, 2265 2583,
Mob: 9331023551/9331123551,
E-mail: tuhin1159@gmail.com,
omegainstk@gmail.com

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Program Schedule Day-1 (4th January, 2025, Saturday)

Registration 8:00-8:45AM

11:00-12:00PM: Inaugural Ceremony (Mukto Mancha)

Garlanding the portrait of Prof. Asima Chatterjee and Song

Welcome Address by the Conference Chair and Vice-President of Professor Asima Chatterjee Foundation Kolkata (PACFK)

Address by the Vice Chancellor, University of Calcutta (*CU*)

Address by *the Registrar, Biswa Bangla Biswabidyalay (BBB)*

Address by *the President, Luminescent Organic Consortium of India (LOCI)*

Address by: The Guest of Honour, Dr. Shashi Panja
Honourable Minister-in-Charge, Department of Industries, Commerce & Enterprises, Women & Child Development and Social Welfare, Govt. of West Bengal, Kolkata

Inaugural Address by the Honourable *Guest-in-Chief*, His Excellency Dr. Bratyabrata Basu
Minister-in-Charge, Department of Education, Govt. of West Bengal, Kolkata

Tea Break: 12:00-12:25PM

Hall-1 (Meghnad Saha Auditorium, Meghnad Saha Bhavan, 1st floor) ***Technical Session 1***	**Hall-2 (J N Bhar Auditorium, Institute of Radiophysics, 1st floor)** ***Technical Session 2***	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session 3***	**Hall-4 (N R Sen Auditorium, Ground floor)** ***Technical Session 4***
***Sponsored by* Syngenta Biosciences Pvt. Ltd.**			
Chairperson: Prof **Lucia CAPORASO, Italy**	**Chairman:** **Prof. Brindaban C. Ranu, IACS**	**Chairman:** **Prof. Dhrubajyoti Chattopadhyay, Sister Nivedita University**	**Chairman:** **Prof. Atul Goel, CDRI**

9:00AM-9:30 AM **Plenary Lecture-1: PAC Award Lecture (National)** **Speaker: Prof. Hiriyakkanavar Ila, JNCASR Bangalore** **Title:** Design and Development of New Synthetic Methods for Biologically Important Heterocycles: Few Reminiscences and Reflections	**9:00AM-9:30AM** **Plenary Lecture -5:** **Speaker: Prof. Biplab Maji, IISER Kokata** **Title:** Remote Regio- and Enantioselective $C(sp^2)$–H Activation: Substrate vs Catalyst Control	**9:00AM-9:30AM** **Plenary Lecture -7** **Speaker: Prof. Asit K. Chakraborti, IACS Kokata** **Title:** New Therapeutic Leads through Sustainable Medicinal Chemistry	**9:00AM-9:30AM** **Plenary Lecture-9** **Speaker: Prof. Amitava Das, IISER Kokata** **Title:** Nanostructured Aggregates Short Peptides for Therapeutic Applications
9:30-10:00 AM **Plenary Lecture -2: PAC Award Lecture (International)** **Speaker: Prof. Bimal K. Banik,** Prince Mohammed Bin Fahd University, Saudi Arabia **Title:** Discovery of New Beta-Lactams as Novel Anticancer Agents	**9:30-10:00 AM** **Plenary Lecture -6** **Speaker: Prof. Subhabrata Sen, SNU** **Title:** C-H functionalization to heterocycles and heteroarenes	**9:30-10:00 AM** **Plenary Lecture -8** **Speaker: Prof. Kaustabh Kumar Maiti, NIIST, Trivandrum** **Title:** Exploring Therapeutic Potential of Phytochemical Entities Through Surface-enhanced Raman Spectroscopy	**9:30-10:00 AM** **Plenary Lecture-10** **Speaker: Prof. Suhrit Ghosh, IACS, Kolkata** **Title:** Ferroelectricity and Piezoelectricity in Supramolecular Donor-Acceptor Materials
10:00-10:30 AM **Plenary Lecture -3** **Speaker: Prof. Pierre H. Dixneuf, University of Rennes, CNRS, France** **Title:** Catalytic Functionalisations of Phosphine C-H bonds and New reactions of Interrupted Reduction Intermediates	**10:00-10:20 AM** **Invited Lecture-1** **Speaker: Dr. Arunabha Thakur, Jadavpur University** **Title:** Controlled Photooxidation *via* Singlet Oxygen Generation by Triplet Harvesting in a Heavy Atom Free Pure Organic Dithienylethene-Naphthalene Diimide	**10:00-10:20 AM** **Invited Lecture-4** **Speaker: Prof. Animesh Das, IIT Guwahati** **Title:** Selective C-C and C-O Bond Forming Reaction using Electron-Poor Metal Catalysts	**10:00-10:20 AM** **Invited Lecture-7** **Speaker: Dr. Nayan Ranjan Singha** **Title:** Supramolecular Chemistry of Non-Aromatic Electro-Active Luminescent Polymers towards Multi-Purpose Sensing and Opto-Electronic Responses

10:30-11:00 AM **Plenary Lecture-4: PAC Award Lecture (Industry)** **Speaker: Dr. Manjunath Bhanu,** **Syngenta Biosciences Pvt Ltd** **Title:** Research and Development in Crop Protection – Idea to Market	**10:20-10:40AM** **Invited Lecture-2** **Speaker: Prof. Debdas Ray, SNU** **Title:** Triplet harnessing and why we should care!	**10:20-10:40AM** **Invited Lecture-5** **Speaker: Prof. Soumyaditya Mula, BARC** **Title:** BODIPY Based Heavy-Atom-Free Triplet Photosensitizers for Photodynamic Therapy of Cancer	**10:20-10:40AM** **Invited Lecture-8** **Speaker: Prof. Tanusree Bala, CU** **Title:** There's Plenty of Room at the Interface
	10:40-11:00 AM **Invited Lecture-3** **Speaker: Prof. Ram Kinkar Roy,** BITS-Pilani Rajasthan **Title:** Investigation of Nonradiative Relaxation of Tetrabenzo-heptafulvalene Derivative by Spin-Flip Time Dependent Density Functional Theory (SF-TDDFT): A Computational Approach to Explore the Aggregation-Induced Emission Mechanism	**10:40-11:00 AM** **Invited Lecture-6** **Speaker: Prof. Shanti Gopal Patra, NIT Silchar** **Title:** NHC-Transition Metal Catalyzed Dehydrogenative Oxidation of Alcohols to Carboxylic Acids	**10:40-11:00 AM** **Invited Lecture-9** **Speaker: Prof. Subhasis Roy, CU** **Title:** Harnessing Nanomaterials for Solar-Driven Photoelectrochemical Water Splitting: Chemistry for a Sustainable Future
12:00-12:25 PM	**Tea Break & Poster Session**		
Hall-1 (Meghnad Saha Auditorium, Meghnad Saha Bhavan, 1st floor) ***Technical Session 5***	**Hall-2 (J N Bhar Auditorium , Institute of Radiophysics, 1st floor)** ***Technical Session 6***	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session 7***	**Hall-4 (N R Sen Auditorium, Ground floor)** ***Technical Session 8***
Sponsored by Aurigene Discovery Technology Limited			
Chairman: **Prof. Giuseppe Aiello, Italy**	**Chairman:** **Indrajeet Sharma, University of Oklahoma**	**Chairman:** **Prof. Chhanda Mukhopadhyay, Calcutta University**	**Chairman:** **Prof. Chaitali Mukhopadhyay, Calcutta University**
12:30PM-1:00 PM **Plenary Lecture-11: PAC Award Lecture (Industry)**	**12:30PM-1:00 PM** **Plenary Lecture-13** **Speaker: Prof. Subhas C. Pan, IIT**	**12:30PM-1:00 PM** **Plenary Lecture-15** **Speaker: Prof. Tushar Kanti**	**12:30PM-1:00 PM** **Plenary Lecture-17** **Speaker: Prof. Anirban Bhattacharyya,**

Speaker: Dr Susanta Samajdar, Aurigene Discovery Tech. Ltd. **Title:** Discovery of first-in-class Pan KRAS degrader clinical candidate for the treatment of mutant KRAS driven cancers	**Guwahati** **Title:** Silver, Indium and Rhodium Catalyzed Cyclization Reactions	**Chakraborty, IISc, Bengaluru** **Title:** Endo-trig Radical Cyclization in the Synthesis of Terpenoid Natural Products	**Calcutta University** **Title:** Materials Growth and Unique Alloy Properties of Group III-Nitride Semiconductors
Time: 1:00-1:30 PM **Plenary Lecture-12: PAC Award Lecture (International)** **Speaker: Prof. Stephen Hashmi, Germany** **Title:** New Reactivity Patterns by Gold Catalysis	**Time: 1:00-1:30 PM** **Plenary Lecture -14** **Speaker Prof. Sitaram Pal, KIIT** **Title:** Synthesis of Spiroindolenines & Carbamates to find an Agro-Chemical Lead	**Time: 1:00-1:30 PM** **Plenary Lecture -16** **Speaker: Prof. Vinod Kumar Tiwari, Banaras Hindu University, Banaras** **Title:** Growing Impact of 'Click Chemistry' in Glycoscience: Development of Diverse Glycohybrids/Glycodendrimers and their Applications	**Time: 1:00-1:30 PM** **Plenary Lecture-18** **Speaker: Prof. Inamur R. Laskar, BITS Pilani** **Title:** Molecular Luminescent Compounds for Efficient Analyte Sensing in Vapor/ or Gas Phase
1:30-3:25PM	**Lunch Break**		
Hall-1 (Meghnad Saha Auditorium, Meghnad Saha Bhavan, 1st floor) **Technical Session 9**	**Hall-2 (J N Bhar Auditorium , Institute of Radiophysics, 1st floor)** ***Technical Session* 10**	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session* 11**	**Hall-4 (N R Sen Auditorium, Ground floor)** ***Technical Session* 12**
Sponsored by PI Heath Sciences Ltd			
Chairperson: **Prof. Frederic W. Patureau, Germany**	**Chairperson:** **Prof. Avijit Banerji, CU**	**Chairperson:** **Prof. Julie Banerji, Calcutta University**	**Chairperson** **Prof. Pinaki Choudhuri, Calcutta University**
3:30-4:00PM **Plenary Lecture-19: PAC Award Lecture** **Speaker: Prof. Debabrata Maiti, IIT Bombay** **Title:** Utilization of CO2 in synergistic triple catalysis for	**3:30-4:00PM** **Plenary Lecture-21** **Speaker: Prof. P. Shanmugam, CLRI** **Title:** Cerium Ammonium Nitrate (CAN)/ROH And Iodine/CAN As Efficient Reagents For C-H	**3:30-4:00PM** **Plenary Lecture-23** **Speaker: Prof. Debasish Bandyopadhyay, CU, Kolkata** **Title:** Melatonin protects against non-steroidal anti-inflammatory drug-induced gastric ulceration:	**3:30-4:00PM** **Plenary Lecture-25** **Speaker: Prof. Patit P. Kundu, IIT Roorkee** **Title:** Development of various transition metals, nitrogen and sulfur doped carbon

anti-Markovnikov hydrocarboxylation of industrial alkenes	Functionalization: Synthetic Transformation Of MBH Adducts Of N-Methyl Isatin, 3,3'-Bis-Indolyl And 3,3'-Bis-7-Azaindolylmethane	Mechanism(s) and significance	for application as cathode catalyst in single chamber microbial fuel cell
Time: 4:00-4:30PM **Plenary Lecture-20: PAC Award Lecture: Dr. Sunil K. Mandal, PI Heath Sciences Ltd** **Topic:** Synergy for Sustainability: The power of Collaboration and Partnership in Driving Innovation **Invited Lecture:** **Speaker: Dr. Sandeep Jain, PI Industries** **Title:** Technologies for Continuous Manufacturing: Reaction, Inline work-up and beyond	**Time: 4:00-4:30PM** **Plenary Lecture-22** **Speaker: Prof. Arindam Indra, IIT Bhubaneswar** **Title:** Building a bridge between organometallic chemistry and energy conversion processes	**Time: 4:00-4:30PM** **Plenary Lecture-24** **Speaker: Prof. Asish Ranjan Das, CU** **Title:** Photosynthetic and Electrosynthetic Approaches towards Sustainable Synthesis of Drug-like Cores	**Time: 4:00-4:30PM** **Plenary Lecture-26** **Speaker: Prof. Soumyajit Das, IIT Ropar** **Title:** π-Extended Antiaromatic Indenofluorenes: From Targeted to Unusual Syntheses and Open-shell Properties
4:30-4:55 PM Tea Break & Poster Session			
Hall-1 (Meghnad Saha Auditorium, Auditorium, Meghnad Saha Bhavan, 1st floor) **Technical Session 13**	**Hall-2 (J N Bhar Auditorium , Institute of Radiophysics, 1st floor)** ***Technical Session* 14**	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session* 15**	**Hall-4 (N R Sen Ground floor)** ***Technical Session* 16**
Sponsored by *Wiley*			
Chairman: **Prof. Shoubhik Das, Germany**	**Chairman** **Prof. Naohiko Yoshikai, Tohoku University, Japan**	**Chairman** **Dr. Sukhendu Mandal** **IICB, Kolkata**	**Chairperson** **Prof. Nikhil Guchhait, Calcutta University**

5:00-5:30PM **Plenary Talk-27: PAC Award Lecture (National)** **Prof. Brindaban C. Ranu, IACS** **Title:** My Journey through a Green Path: Mechanosynthesis - A Powerful Tool for the Chemical Transformation and Synthesis of Biologically Active Molecules and Functional Materials	**5:00-5:30PM** **Plenary Talk-28:** **Speaker: Prof. Ravi P. Singh, IIT Delhi** **Title:** New Endeavours in Asymmetric Vinylogous Reactions: Towards Functionally Rich Synthon	**5:00-5:30PM** **Plenary Talk-29:** **Speaker: Prof. Aniruddha Banerji, St Xavier's College** **Title:** Exploring the potential of some natural phytochemicals for targeting epidermal growth factor receptor (EGFR) in breast cancers	**5:00-5:30PM** **Plenary Talk-30:** **Speaker: Prof. Apurba Lal Koner, IISER Bhupal** **Title:** Fluorescent molecular rotors for understanding sub-cellular stress and communication
5:30-5:50 PM **Wiley Sponsor Talk** **Speaker: Dr. Subhabrata Mukhopadhyay, Wiley** **Title:** Pubic Ethics and Scope of Generative AI in Scientific Pubication	**5:30-5:50 PM** **Invited Lecture-10** **Speaker: Prof. Basker Sundararaju, IIT Kanpur** **Title:** Evolution of Co(III)-Catalysis in Asymmetric C-H Bond Functionalizations	**5:30-5:50 PM** **Invited Lecture-11** **Speaker: Prof. Srijit Biswas, CU** **Title:** 3-Membered Aza-Heterocycles; A Versatile Precursor Towards Pharmaceuticals & Value Added Chemicals	**5:30-5:50 PM** **Invited Lecture-12** **Speaker: Prof. Sk Masum Nawaz, BITS Pilani Hyderabad** **Title:** Contact-Electrification for Energy Harvesting and Self-Powered Sensors
Hall-1 (Meghnad Saha Auditorium, Meghnad Saha Bhavan, 1st floor) **Technical Session *17***	**Hall-2 (J N Bhar Auditorium , Institute of Radiophysics, 1st floor)** ***Technical Session 18***	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session 19***	**Hall-4 (N R Sen Auditorium, Ground floor)** ***Technical Session* 20**
Sponsored by *Royal Society of Chemistry India Private Limited*			
5:50-6:20PM **Plenary Talk-31:** **Speaker: Prof. Malte Brasholz** **Title:** New Radical-Induced and Photooxidative Syntheses of *N*-Heterocycles and Alkaloids	**5:50-6:20PM** **Plenary Talk-32:** **Speaker: Prof. Indu Bhusan Deb, IICB** **Title:** Synthesis of Functionalized N-Heterocycles via Electrochemical and Annulation Reactions	**5:50-6:20PM** **Plenary Talk-33:** **Speaker: Prof. Smritimoy Pramanik, Calcutta University** **Title:** Interaction of Curcumin and Curcumin Pyrazole with DNA G-quadruplexes	**5:50-6:20PM** **Plenary Talk-34:** **Speaker: Prof. Sanchita Goswami, Calcutta University** **Title:** Visualization of Excited State Intramolecular Proton Transfer (ESIPT) in benzimidazole based chemosensors

6:20-6:40 PM **RSC Sponsor Talk:** **Speaker: Dr. Rajdip Roy, RSC India Pvt Ltd** **Title:** RSC: Building Community	**6:20-6:40 PM** **Invited Lecture-13** **Speaker: Prof. Mossaraf Hossain, NBU** **Title:** The novel compounds to combat multiple cancers: Synthesis of 2-acetoxyimidazole derivatives from imidazole N-oxides	**6:20-6:40 PM** **Invited Lecture-14** **Speaker: Prof. Saikat Khamarui, GGDCK** **Title:** Ru-Catalysis for C-H Activation vs Rearrangement: Diverse Array of Functionalized Molecules	**6:40-6:50 PM** **Invited Lecture-15** **Speaker: Prof. Anindita Das, IACS** **Title:** A Versatile Step-Growth Polymerization Route to Enzymatically Degradable Functional Polyesters and Their Biomedical Implications

6:40-7:10 PM

Mukto Mancha

Panel Discussion: Industry Academia Consortium

Chairpersons: Dr. Manjunath Bhanu, Director, Syngenta Biosciences Pvt Ltd
Dr. Sunil K. Mandal, Vice-President, PI Health Sciences Ltd
Prof. Atul Goel, Senior Professor, CDRI
Prof. Dilip K. Maiti, Vice-Chancellor, Biswa Bangla Biswabidyalay

Resource Persons

Dr Dipak R Patil	**PI Industries Ltd, Udaipur**	**Senior Research Scientist**
Dr Gururaj P. Kini	**PI Industries Ltd, Udaipur**	**Team Leader**
Dr. SARABINDU ROY	**PI Industries Ltd, Udaipur**	**GROUP LEADER**
Dr. Subir Sadhukhan	**Assistant Director at Curia India Pvt. Limited**	
Mr. Dilip Venkatrao Jarikote	**Curia India Pvt. Ltd.**	**Senior Research Scientist II**
Mr. Erigala Venkata Reddy	**Curia India Pvt. Ltd.**	**SRS-III**
Mr. Pritam Biswas	**Curia India Pvt. Ltd.**	**Senior Research Scientist-I**
Dr Sandeep Jain	**PI Industries Ltd**	**Sr. Director- Special Technologies**
Dr Dushyant Jain	**PI Industries Ltd**	**Team Leader- Special Technologies**
Dr Abhishek Sud	**PI Industries Ltd**	**Sr. Group Leader- Process R&D**
Mr. Vijay Kalla	**PI Industries Ltd**	**Sr. Team Leader- Process Engineering**

7:10-9:30 PM	**Dinner**

Day 2: 5th January 2025 (Sunday)

Hall-1 (Meghnad Saha Auditorium, Meghnad Saha Bhavan, 1st floor) Technical Session 21	**Hall-2** (J N Bhar Auditorium , Institute of Radiophysics, 1st floor) *Technical Session 22*	**Hall-3** (Chemistry Lecture Theatre, Palit Building, 1st floor) *Technical Session 23*	**Hall-4** (N R Sen Auditorium, Ground floor) *Technical Session 24*
Sponsored by Akzo Nobel India Limited, Dulux			
Chairperson: **Prof. Hiriyakkanavar Ila, JNCSAR Bangalore**	**Chairperson:** **Prof. Mark Gandelman, Technion Institute, Isreal**	**Chairperson:** **Prof. Ricardo Castarlenas, ISQCH, Spain**	**Chairperson:** **Prof. Nilay Karchaudhuri, BRSNC**
9:00AM-9:30 AM **Plenary Lecture-35** **Speaker: Indrajeet Sharma, University of Oklahoma, USA** **Title:** Harnessing Carbene/Nitrenes for Drug Discovery	**9:00AM-9:30 AM** **Plenary Lecture-39** **Speaker: Prof. A. T. Biju, IISc Bangalore** **Title:** Lewis Acid-Catalyzed Reactions of Bicyclo[1.1.0]butanes (BCBs) for the Synthesis of Functionalized Bicyclic Frameworks	**9:00AM-9:30 AM** **Plenary Lecture-43:** **Prof. Surajit Ghosh, IIT Jodhpur** **Title:** Quinazoline and Quinoline Based Small Molecules as Utrophin Upregulator via AhR Antagonism for the Treatment of Duchenne Muscular Dystrophy	**9:00AM-9:30 AM** **Plenary Lecture-47** **Speaker Prof. Arnab Rit, IIT Madras** **Title:** Nanotechnology-Assisted Detection of Blood Cholesterol and White-Light Emission in Aqueous Solutions
9:30-10:00 AM **Plenary Lecture -36** **Speaker: Prof. Naohiko Yoshikai,** Tohoku University, Japan **Title:** Novel Reaction and Structural Chemistry of Hypervalent Iodine Compounds	**9:30-10:00 AM** **Plenary Lecture-40:** **Speaker: Prof. Manas K. Ghorai, IIT Kanpur** **Title:** Synthesis of bioactive molecules using MOC, DROC and ROC Strategies	**9:30-10:00 AM** **Plenary Lecture-44** **Speaker: Prof. P. Jaisankar, IICB, Kolkata** **Title:** Development of Novel Bioactive Small Molecules from Synthetic and Natural Sources for Infectious and Non-Infectious Diseases	**9:30-10:00 AM** **Plenary Lecture-48** **Speaker: Prof. Ajit K. Mahapatra, IIEST** **Title:** Chromo-fluorogenic sensors for chemical warfare agents in real-time analysis: A unique non-invasive chemodosimetric approach

10:00-10:30 AM **Plenary Lecture -37** **Speaker: Prof. Lucia Caporaso,** University of Salerno, Italy **Title:** Advances in Upcycling Polyethylene: Exploring E-CO Copolymerization through DFT Calculations for Sustainable Solutions	**10:00-10:30AM** **Plenary Lecture-41** **Speaker: Prof. Abu T. Khan, IIT Guwahati** **Title:** Greener Synthesis of Substituted Quinolines and Polycyclic Heteroaromatics	**10:00-10:30AM** **Plenary Lecture-45** **Speaker: Prof. Manab Chakraborty, BITS Pilani** **Title:** Phosphonate to Aldehyde Conversion using Molecular Oxygen: An Intermediate Trapping Approach to Access Vital Fluorophores	**10:00-10:30AM** **Plenary Lecture-49** **Speaker: Prof. Sudip Kumar Das, Calcutta University** **Title:** Pb(II) removal from its aqueous solution using raw and fermented nut shells
10:30-11:00 AM **Plenary Lecture-38** **Speaker: Prof. Isabelle Chataigner, Sorbonne Université, CNRS, France** **Title:** Dearomatizing Diels-Alder Reactions of Nitroarenes with Silyloxydienes. DFT as a Tool to Control Diastereoselectivity	**10:30-11:00 AM** **Plenary Lecture-42** **Speaker:** **Prof. Chandan K. Jana, IIT Guwahati** **Title:** Switching Nitrone Reactivity: Arene Functionalization of Nitrosoarenes	**10:30-11:00 AM** **Plenary Lecture-46** **Speaker: Prof. Mainak Banerjee, BITS Pilani** **Title:** Solid-phase Mechanochemical Tandem C-H Activation	**10:30-11:00 AM** **Plenary Lecture-50** **Prof. Amiya K. Panda, Green University** **Title:** Methanolic Extract of *Acorus calamus* Rhizome Loaded Nanostructured Lipid Carriers: Preparation, Physicochemical Properties and *In Vivo* Anti-allergic Activity Studies
11:00-11:25 AM	**Tea Break & Poster Session**		
Hall-1 (Meghnad Saha Auditorium, Auditorium, **Meghnad Saha Bhavan, 1st floor)** **Technical Session** ***25***	**Hall-2 (J N Bhar Auditorium ,** **Institute of Radiophysics, 1st floor)** ***Technical Session 26***	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session 27***	**Hall-4 (N R Sen Ground floor)** ***Technical Session 28***
Sponsored by Reddy's laboratory			
Chairperson: **Prof. Bimal K. Banik, Saudi Arabia**	**Chairperson:** **Prof. Ralf Jackstell LIKAT, Germany**	**Chairperson:** **Prof. Dipak R. Mal, IIT Kharagpur**	**Chairperson:** **Prof. Sasankha S. Mohanta CU**
11:30AM-12:00 PM **Plenary Lecture-51**	**11:30AM-12:00 PM** **Plenary Lecture-55**	**11:30AM-12:00 PM** **Plenary Lecture-57**	**11:30AM-12:00 PM** **Plenary Lecture-59**

Speaker: Prof. Frederic W. Patureau, RWTH Aachen University, Germany **Title**: Development of Cross Dehydrogenative Coupling Reactions	**Speaker: Prof. Partha S. Das, IIT Dhanbad** **Title:** Expanding Discovery Chemistry Toolbox: From Concept to Practice	**Speaker: Prof. Susanta Sekhar Adhikari, Calcutta University** **Title:** Development of a new class of self-aggregative bis-arylidene Oxindole as broad- spectrum breast cancer and colorectal cancer-selective therapeutics	**Prof. Subrata Ghosh, IIT Mandi** **Title:** Organic Small Molecules for OLED Technology
12:00 PM-12:30 PM **Plenary Lecture-52** **Speaker: Prof. Shoubhik Das, University of Bayreuth, Germany** **Title:** Selectivity-Driven Sustainability by Using Single Atom Photocatalysts	**12:00 PM-12:30 PM** **Plenary Lecture-56** **Speaker:** **Goutam Brahmachari, Visva Bharati, Shantiniketan** **Title:** Electrochemistry-Driven Organic Synthesis	**12:00 PM-12:30 PM** **Plenary Lecture-58** **Speaker: Prof. Soumen Basu, TIET** **Title:** Revolutionizing Photocatalysis: High-Performance Monolithic Metal	**12:00 PM-12:30 PM** **Plenary Lecture-60** **Prof. Sujit Kumar Ghosh, Jadavpur University** **Title:** Electromagnetic Coupling Effect on the Plasmonic Properties of Gold Nanostructures
Time: 12:30PM-1:00 PM **Plenary Lecture-53** **Speaker: Prof. Ricardo Castarlenas, ISQCH Spain** **Title:** Ligand-Controlled Interrupted Alkyne Dimerization within Rh-NHC Architectures	**Time: 12:30PM-12:50 PM** **Invited Lecture-16** **Prof. Kalyan K. Sadhu, IIT Roorkee** **Title:** Oxygen: a reagent to generate air stable carbon centered radicals	**Time: 12:30PM-12:50 PM** **Invited Lecture-19** **Speaker: Prof. Tapas Ghosh, Jadavpur University** **Title:** Employing Nickel Catalysis to Access Heterocyclic Scaffolds and APIs: Mechanistic Study and Docking Interactions	**Time: 12:30PM-12:50 PM** **Invited Lecture-22** **Prof. Mijanur Rahaman, CU** **Title:** Polymer based smart nanoassemblies for cancer cell selective drug delivery applications
Time: 1:00-1:30 PM **Plenary Lecture-54: PAC Award Lecture** **Speaker: Dr. Rakeshwar Bandichhor** **Title:** Strategies for Synthesis of Eribulin Related Substances: A	**12:50-1:10PM** **Invited Lecture-17** **Speaker: Prof. G. Jayamurugan, INST Mohali** **Title:** Nanotechnology-Assisted Detection of Blood Cholesterol and White-Light Emission in Aqueous	**12:50-1:10PM** **Invited Lecture-20** **Speaker: Prof. Saugata Hazra, IIT Roorkee** **Title:** Unraveling Novel Mechanisms Targeting β-Lactam Antibiotics: Crystallographic Revelations Shaping the Atomistic	**12:50-1:10PM** **Invited Lecture-23** **Speaker: Prof. Suman Kalyan Samanta, IIT Kharagpur** **Title:** Conjugated and Non-conjugated Porous Organic Polymers in Sustainable Photocatalytic and Adsorptive Environmental Remediation

Stereochemical Insight	Solutions	Blueprint for Next-Generation Diagnostics Against Antimicrobial Resistance (AMR)	
	1:10-1:30PM **Invited Lecture-18** **Prof. Debashis Chakraborty, IIT Madras** **Title:** Biodegradable Polymers and Copolymers	**1:10-1:30PM** **Invited Lecture-21** **Speaker: Dr. Bibaswan Biswas, CCRH** **Title:** Pharmacopeial Standardization of Homoeopathic medicines in India: The present practice and potential future development	**1:10-1:30PM** **Invited Lecture-24** **Speaker: Prof. Amitava Mandal, Raiganj University** **Title:** Assembling a New Generation Smart Materials with Supramolecular Approaches
1:30-3:25PM	**Lunch Break & Poster Session**		
Hall-1 (Meghnad Saha Auditorium, Meghnad Saha Bhavan, 1st floor) **Technical Session 29**	**Hall-2 (J N Bhar Auditorium , Institute of Radiophysics, 1st floor)** ***Technical Session* 30**	**Hall-3 (Chemistry Lecture Theatre, Palit Building, 1st floor)** ***Technical Session* 31**	**Hall-4 (N R Sen Auditorium, Ground floor)** ***Technical Session* 32**
Sponsored by *TCG Life Sciences Limited*			
Chairperson: **Prof. Pierre H. Dixneuf, *University of Rennes***	**Chairperson:** **Prof. Isabelle Chataigner, CNRS, France**	**Chairperson:** **Prof. Manas Chakrabarti** **Bose Institute, Kokata**	**Chairperson:** **Prof. Amrita Chatterjee, BITS Pilani Goa**
3:30-4:00PM **Plenary Lecture-61** **Speaker: Prof. Gandelman Mark, Technion – Israel Institute of Technology, Israel** **Title:** Nitrenium Ions: Ligands, Reagents, Catalysts	**3:30-4:00PM** **Plenary Lecture-63** **Speaker: Prof. Debaraj Mukherjee, Bose Institute** **Title:** Effect on C-2 Carbonylation of Sugar Enol Ethers Towards Altered Reactivities	**3:30-4:00PM** **Plenary Lecture-65** Speaker: **Prof. Samit Guha** Title: Design of Multifunctional Mechanically Interlocked Molecules-Based Targeted Imaging Agents	**3:30-4:00PM** **Plenary Lecture-67** **Prof. Sk. Manirul Islam, Kalyani University** **Topic:** Development of functionalized porous materials and their catalytic applications

4:00-4:30PM **Plenary Lecture-62** **Speaker:** **Prof. Mate Erdelyi, Upsalla University, Sweden** **Title***:* Halogen bond activation in gold catalysis	**4:00-4:30PM** **Plenary Lecture-64** **Speaker: Prof. Ganesh Venkataraman, IIT Kharagpur** **Title:** Nickel-Catalyzed Oxidative Cyclization of π-Systems	**4:00-4:30PM** **Plenary Lecture-66** **Speaker: Prof. Sandipan Halder** **Title**: Organocatalytic Domino Protocol: A Potential Tool for the Synthesis of Biologically Prevalent Ring Systems	**4:00-4:30PM** **Plenary Lecture-68** **Speaker: Prof. Sanjib Banerjee IIT Bhilai** **Title:** Sustainable Synthesis of Molecular Materials for Engineering and Biomedical Applications
Time: 4:30-4:50PM **Invited Lecture-25: PAC Award Lecture** **Speaker: Prof. Sudipta Raha Roy, IIT Delhi** **Title:** Utilizing Renewable Energy to Functionalize C(sp2)-H Bond for the Synthesis of Value-Added Compounds	**4:30-4:50PM** **Invited Lecture-27** **Speaker: Dr. Sushobhan Ghosh, Alipurduar University** **Title:** Semiconducting Behavior of Organic Cocrystal Driven by the Proton Coupled Charge Transfer Through H-bonding	**4:30-4:50PM** **Invited Lecture-29** **Speaker: Prof. Safiul Alam, AU** **Title**: Synthesis of Carbazoles via Palladium-Catalyzed Aryl C–H Activation Under Green Conditions and Study of Their Interactions with Calf-thymus DNA	**4:30-4:50PM** **Invited Lecture-31** **Speaker: Prof. Achintya Singha, Bose Institute** **Title**: Tuning exciton-plasmon interaction in transition metal dichalcogenides coupled with noble metal nanostructures
Time: 4:50-5:10PM **Invited Lecture-26** **Speaker: Dr. Subir Sadhu Khan, Curia India** **Title:** Saponin: A Green and Efficient Natural Surfactant for Suzuki-Miyaura Cross-Couplings of Heteroaryl Substrates in Aqueous Media at Ambient Conditions	**4:50-5:10 PM** **Invited Lecture-28** **Speaker: Prof. Ranjan Jana, IICB** **Title:** Molecular Diversity via Switchable 1,2-Shift in C-H Activation Cascade	**4:50-5:10 PM** **Invited Lecture-30** **Speaker: Dr. Palash Pandit, SNIM** **Title:** Hydrazino Helicenes: Unlocking their Potential as High-Energy Organic Molecules for Rechargeable Lithium-Ion Batteries	**Time: 4:50-5:10PM** **Invited Lecture-32** **Speaker: Dr. Moupiya Ghosh, IEM-UEM** **Title:** Enhanced antibacterial activity of azithromycin conjugated magnetic nanocarrier
5:10-5:35 PM **Tea Break & Poster Session**			
Hall-1 (Meghnad Saha Auditorium,	**Hall-2 (J N Bhar Auditorium ,**	**Hall-3 (Chemistry Lecture**	**Hall-4 (N R Sen**

Auditorium, **Meghnad Saha Bhavan, 1st floor)** **Technical Session 33**	**Institute of Radiophysics, 1st floor)** ***Technical Session*** **34**	**Theatre, Palit Building, 1st floor)** ***Technical Session*** **35**	**Ground floor)** ***Technical Session*** **36**
Sponsored by PerkinElmer (INDIA) Private Limited			
Chairperson: Prof. Stephen Hashmi, Germany	**Chairperson:** **Prof. Malte Brasholz, University of Rostock, Germany**	**Chairperson:** **Prof. Jhimli Sengupta, West Bengal State University**	**Chairperson:** **Prof. Aparna De, SCGC, Kolkata**
5:40-6:10PM **Plenary Lecture-69:** **Speaker: Prof. Ralf Jackstell, Leibniz Institut für Katalyse, Germany** **Title:** Homogenous Carbonylations of olefins and alkynes	**5:40-6:10PM** **Plenary Lecture-70:** **Speaker: Prof. M. Bakthadoss, PU** **Title:** Distal meta-C–H functionalization of α-substituted cinnamates	**5:40-6:10PM** **Plenary Lecture-71:** **Speaker: Prof. M. Murali, NC Tirchi** **Title:** Bioinspired Models for Copper Oxidases: Experimental and theoretical approach	**5:40-6:10PM** **Plenary Lecture-72:** **Prof. Soumyajit Roy, IISER Kolkata** **Title:** From Catalysis to A Device in Market: On Soft-oxometalates
6:10-6:30 PM **Invited Lecture-33** **Prof. Joyram Guin, IACS** **Title:** Light-Induced Oxime Group Transfer Using Sulfonyl Oxime Ethers	**6:10-6:30PM** **Invited Lecture-35** **Speaker: Prof. S. Peruncheralathan, NISER Bhubaneswar** **Title:** New Strategies For Benzoheterocycle Synthesis and Functionalization	**6:10-6:30PM** **Invited Lecture-38** **Peaker: Dr. Bubun Banerjee, AU** **Title:** Green and sustainable synthesis: Our developments	**6:10-6:30PM** **Invited Lecture-41** **Speaker: Dr. Tithi Maity** **Title:** Design and Development of Cu/Fe/In/Eu/Zn Complexes and Coordination Polymers for Sustainable Health and Environmental Applications
6:30-6:50 PM **Invited Lecture-34** **Dr. Nanda Dulal Paul, IIEST** **Title:** Ligand-Centered Redox	**6:30-6:50PM** **Invited Lecture-36** **Speaker: Prof. Sayanti Chatterjee, IIT Roorkee** **Title:** Unlocking an Eco-Friendly -NH to -O Functional Group Transfer Strategy for In-water	**6:30-6:50PM** **Invited Lecture-39** **Speaker: Prof. Raj Nandi, Jadavpur University** **Title:** Functionalization of heterocycles by exploitation of week bond of hypervalent iodine	**6:30-6:50PM** **Invited Lecture-42** **Speaker: Prof. Goutam Biswas, CBPBU** **Title:** Introduction of Jeanbandyite Currency in Material World

Induced Chemical Transformations. **6:50-7:10 PM** **Special Lecture** **Speaker: Prof. Giuseppe Aiello** **Title:** Marine life diversity through time: a paleoecological perspective from the Paleozoic to the Anthropocene	Transformation of Organic Sulfides	reagent and its application towards therapeutic interest	
	6:50-7:10PM **Invited Lecture-37** **Speaker: Dr. Krishnanka Shekhar Gayen** **Title:** Synthesis of Low-Valent Metal Nanoparticles By Green Method And Development of Their Catalytic Reduction Properties	**6:50-7:10PM** **Invited Lecture-40** **Prof. Soumen K. Samanta, Biswa Bangla Biswabidyalay** **Title:** Organic-Inorganic Hybrid Materials for Biomedical Applications	**6:50-7:10PM** **Invited Lecture-43** **Speaker: Prof. Hari Shankar Biswas, SNC** T**itle**: Recent Progress in Hydrogenated Diamond-Like Carbon Thin Films: Deposition Techniques and Surface Engineering Innovations
7:10-7:30PM **Valedictory Session**			
7:30-10:00 PM	**Dinner**		

Brief CV of Chairpersons

Prof. Lucia Caporaso, Salerno University, Italy

Lucia Caporaso obtained her Ph.D. in Chemistry in 1996 from the University of Naples Federico II, under the supervision of Prof. P. Corradini. After completing her postdoctoral research at the University of Verona (1998–2000) and at the University of Salerno (2000–2004), she began her academic career at the University of Salerno, where she served as Assistant Professor in Industrial Chemistry in the Department of Chemistry and Biology from 2004 to 2017. In 2017, she was appointed Associate Professor of Industrial Chemistry at the same institution. She has also obtained three full professorship national habilitations in the fields of Inorganic Chemistry, Industrial Chemistry, and Principles of Chemical Engineering. In 2011, she was awarded a research fellowship for a DFG-funded project at the Department of Chemistry, University of Konstanz, where she worked in the lab of Prof. Stefan Mecking.Visiting professor at the University of Konstanz (2012 and 2013) and at the KAUST Catalysts Center, King Abdullah University of Science and Technology (2014).She currently collaborates with internationally researchers, including Prof. Stefan Mecking (University of Konstanz, Germany), Prof. Steven P. Nolan (Ghent University, Belgium), Prof. Eugene Y.-X. Chen (Colorado State University, USA), Prof. Moris Eisen (Technion-Israel Institute of Technology, Israel), Prof. Albert Poater (University of Girona, Spain), and Prof. Luigi Cavallo (KAUST Catalysts Center, King Abdullah University of Science and Technology). Her research focuses on understanding reaction mechanisms in both homogeneous and heterogeneous catalysis through computational and experimental approaches. Key areas of interest include: computational studies of polymerization mechanisms with transition metal complexes, the mechanism of organocatalytic reactions, and the theoretical study of electro- and photocatalytic reactions of environmental importance.

Prof. Brindaban C Ranu, School of Chemical Sciences, IACS

Professor Brindaban C. Ranu received his M.Sc. from Calcutta University and obtained his Ph.D. from Jadavpur University working with Professor U.R. Ghatak at Indian Association for the Cultivation of Science. He did his post-doctoral work in Virginia Tech, USA with Prof. T. Hudlicky during 1982-85 and started independent research at the department of Organic Chemistry, IACS from 1985. He became Professor in 1996, senior Professor in 2006 and served as Head of the Organic Chemistry department during 2003-2008. He retired from regular job in 2013 and currently is continuing as INSA Honorary Scientist in the same department. He is a fellow of West Bengal Academy of Science & Technology, Indian Academy of Sciences, Bangalore and Indian National Science Academy, New Delhi. He received the J C Bose fellowship from DST, Govt. of India. He received N.S. Narasimhan Award in 1993 and Chemical Research Society of India Silver medal in 2009 and Sir J C Ghosh Memorial award of Indian Chemical Society in 2018 among others. His work primarily focuses on the issue of Green Chemistry. He has already published 305 papers in highly reputed international journals and currently his h-index is 71. Professor Ranu’s works received considerable appreciation all over the world and he has been invited to deliver key note, plenary and invited lectures in symposia in India and abroad. His research on green synthesis stimulated much interest and inspiration in the chemical community, at large. Professor Ranu has also edited a book entitled, ‘Ball Milling Towards Green Synthesis – Applications, Projects, Challenges’ published by Royal Society of Chemistry in 2015, which received great appreciation from the practicing chemists.

Prof. (Dr.) Dhrubajyoti Chattopadhyay, Vice Chancellor, SNU, Kolkata

Prof. (Dr.) Dhrubajyoti Chattopadhyay is currently the Hon'ble Vice Chancellor of Sister Nivedita University, Kolkata from January 2020 onwards and was the Founder Vice Chancellor of Amity University Kolkata from 2015-2019. Prof. Chattopadhyay was the Dean, Faculty of Science at the University of Calcutta from 2003 to 2007. He was the Pro-Vice Chancellor of the University on 2008 till 2015. He was also the Director at the Centre for Research in Nano Science and Nano Technology at the University from 2007 till 2015. Prof. Chattopadhyay has a research experience of more than 37 years and has a teaching experience of more than 41 years. During his research career he had visited numerous places in India and abroad like USA, UK, Brazil, Australia, Japan, South Korea, China, Thailand, Malaysia and Singapore. 35 students obtained their PhD under his direct and joint supervision during their PhD programme. He has around 150 research papers and 9 book chapters to his credit till date. Prof. (Dr.) Dhrubajyoti Chattopadhyay is a scientist and academic par excellence.

Prof. Dr. Atul Goel did **PhD in the area of Bioorganic and Medicinal Sciences** from the Central Drug Research Institute (CDRI), Lucknow, India in 1998 and postdoctoral research at the National Institutes of Health (NIH), Bethesda, USA during1999-2001. In November 2001, he joined as faculty in the CSIR-CDRI, where he is currently working **as Chief Scientist** in the area of development of new drugs, diagnostics and medical devices. He has guided more than 24 doctoral and 15 postdoctoral fellows and has more than **25 years of research experience**. He has **published >120** peer-reviewed research articles in the journals of high repute and has **18 national and international patents** to his credit. He is a Fellow of Indian Academy of Sciences (FASc) since 2021. His research interests encompass the discovery and development of new affordable medicines/devices and his group is actively involved in developing new fluorescent dyes and nanomaterials for their application in biomedical sciences and optoelectronic (OLEDs) devices. He has licensed and transferred **five technologies** to industries.

(1) Technology of CDRI-399 (BonJon) as Medicated Bone Implant Material for Fracture repair.
(2) Discovery of Investigational New Drug CDRI-1500 (NCE, Under Phase-I Clinical Trial) for Bone Fracture Repair.
(3) Technology of "Fluorescent probes for the development of RT-PCR based detection of COVID-19"
(4) Technology of Nucleic Acid Staining Dye 'GreenR' for biomedical applications
(5) Technology of Fluorescent Quenchers for nucleic acid research and diagnostics

He has received many prestigious awards and honours:

Honors/Awards:

1. **Vasvik Award -2023** for development of indigenous affordable technologies.
2. **Dr. Mridula Kamboj Award-2022** for Technology of a Novel orally active Fracture Healing Drug
3. **CSIR-CDRI Technology Award 2022** for technology of Fluorescent Dyes and Quenchers
4. **NASI Reliance Industries Platinum Jubilee Award 2019**
5. **CSIR Technology Award 2019** by Honorable President of India Shri Ram Nath Kovind Ji
6. **CRSI Bronze Medal 2016** by The Chemical Research Society of India.
7. **Rajib Goyal Prize 2015** by Kurukshetra University
8. **DAE-SRC Outstanding Investigator Award 2015** by Department of Atomic Energy, Science Research Council, Govt. of India.
9. **Alexander von Humboldt Fellowship 2008**, Federal Republic of Germany, Germany.
10. **Young Scientist Award 2005** by Council of Science and Technology, India

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Prof. Giuseppe Aiello, University “Federico II” Naples, Italy

Giuseppe Aiello, obtained his Ph.D. in Sedimentary Geology in 1998 from the University of Naples "Federico II", with a thesis titled *Paleoecology and Biostratigraphy of the Tortonian-Pliocene Ostracod Assemblages of Central-Northern Calabria*. After completing his Ph.D., he carried out research at the Polska Akademia Nauk in Warsaw, Poland, from 1998 to 1999, before returning to the University of Naples "Federico II". In 2018, he was appointed Researcher and, in 2020, Associate Professor in Paleontology at the same institution. He is currently a Professor of Paleontology and Paleoecology in the Department of Earth Sciences at the University of Naples "Federico II".His scientific interests focus on paleontological and ecological studies of ostracods (Ostracoda: Crustacea), benthic foraminifera (Foraminifera: Retaria), and, to a lesser extent, planktic foraminifera from the Miocene to the Recent. His research has extensively explored the taxonomy, paleoecology, and biostratigraphy of marine Miocene, Pliocene and Quaternary ostracods from central and southern Italy, including sedimentary successions deposited in volcanic areas (Phlaegrean Fields, Vesuvius) and in archaeological sites (Pompeii, Salerno). He has also investigated the taxonomy and paleoecology of marine Miocene ostracods of Central Paratethys (Poland) and Eastern Atlantic (Morocco).In addition, he has worked on the taxonomy and ecology of marine ostracod assemblages from the Mediterranean area and the Western Atlantic (Brazil).Further, he has conducted paleoenvironmental studies based on marine and nonmarine calcareous and siliceous meiofaunal assemblages, including benthic foraminifers and ostracods, from Greek Quaternary successions and archaeological sites of the Campania Region. His work also addresses the morphological inter- and intra-specific variability of ostracod shell features and the ecological responses of benthic for aminiferal and ostracod assemblages to anthropogenic impacts in Italian coastal areas.

Prof. Indrajeet (Inder) Sharma, University of Oklahoma, USA

Indrajeet Sharma is an Associate Professor in the Department of Chemistry and Biochemistry at the University of Oklahoma and currently serves as the 2024 Chair of the American Chemical Society-Oklahoma Section. He earned his M.Sc. from the Indian Institute of Technology, Kharagpur, and completed his Ph.D. in glycopeptide chemistry under the guidance of Prof. David Crich, graduating in 2011 from Wayne State University. Dr. Sharma then undertook a Lucille Castori Fellowship at Memorial Sloan-Kettering Cancer Center with Prof. Derek S. Tan before joining the University of Oklahoma in 2014.

Dr. Sharma's research centers on developing innovative synthetic methods leveraging metal-carbene chemistry for applications in total synthesis and drug discovery. His work has garnered substantial funding from prestigious agencies, including the NIH, NSF, DOD, ACS-PRF, and the Oklahoma Center for Science and Technology (OCAST). The findings from his research have been published in high-impact journals such as *ACS Catalysis*, *Nature Communications*, and *Science*.

Awards:

2018: National Science Foundation (NSF)-Early CAREER Award
2018: American Chemical Society (ACS)-PRF Doctoral New Investigator Award
2012–2014: The Lucilli Castori Postdoctoral Fellowship, Memorial Sloan-Kettering Cancer Center
2004–2006: Merit Scholarship, IIT-Kharagpur
2001: Meritorious Award, University of Delhi

Professor Chhanda Mukhopadhyay, Department of Chemistry, University of Calcutta

Prof. Chhanda Mukhopadhyay obtained her PhD Degree under the supervision of Prof. Usha Ranjan Ghatak, the then Director of Indian Association for the Cultivation of Science, Kolkata, in 1991. She did her post doctoral studies initially, under the guidance of Prof. Siddhartha Roy, Bose Institute, Kolkata from 1991-1994 working on structure and dynamics of bent DNA.. She then moved to the United States for her further post doctoral work under the guidance of Prof. Bimal K. Banik, at M.D. Anderson Cancer Centre, Houston from 1998 to 2000 where she worked on "polycyclic aromatic compounds as anticancer agents". Spending a few years at St. Paul's Cathedral Mission College, she joined University of Calcutta in 2005 and was promoted to full professor from June, 2010. At present, Prof. Mukhopadhyay has about 200 publications all in International journals of repute. She works mainly on Organic synthesis, Green Chemistry, heterogeneous catalysis, C-H activation, to mention only a few aspects of her work.

Awards: Gold medal from University of Calcutta for standing first class first in the University in 1984
Chemical Research Society of India, Bronze medal award in 2015
R.S. Verma Memorial Award from Indian Chemical Society in 2015.

CHAITALI MUKHOPADHYAY

Professor, Department of Chemistry, University of Calcutta.

Ph.D. from Molecular Biophysics Unit, Indian Institute of Science, Bangalore.

AREAS OF SPECIALISATION

Chemical and biochemical recognition, structure and dynamics of macromolecules, high resolution and two-dimensional NMR spectroscopy and other spectroscopic measurements on interacting systems, molecular modeling and molecular dynamics simulation of large systems.

Prof. Dr. Frederic W. Patureau, RWTH Aachen University, Germany

Professor Frederic W. Patureau obtained his Ph.D. in 2009 from the University of Amsterdam (UvA, Netherlands) under the guidance of Prof. Dr. Joost N. H. Reek. After postdoctoral studies with Prof. Dr. Frank Glorius at the WWU Münster (2009-2011), he started his independent career as a junior professor at the TU Kaiserslautern. In 2018, he became Synthetic Organic Chemistry Professor at the RWTH Aachen University, Germany.Awards:
Alexander von Humboldt Fellowship
JSP fellowship of the Bürgenstock Conference
Dr. Otto Röhm Memorial Fellowship
Thieme Chemistry Journal Award
ERC Starting Grant

Prof. Naohiko Yoshikai, Tohoku University, Japan

Professor Naohiko Yoshikai obtained his Ph.D. in 2005 from University of Tokyo under the guidance of Professor Eiichi Nakamura. After working as an Assistant Professor at the same university (2005-2009), he moved to Singapore in the summer of 2009 to start his independent career as a Nanyang Assistant Professor at Nanyang Technological University (NTU). He was promoted to an Associate Professor with tenure at NTU in 2016. In the spring of 2021, he returned to Japan to join Tohoku University as a Full Professor.

Awards:
Mukaiyama Award, The Society of Synthetic Organic Chemistry of Japan (2022)
TCI–Singapore National Institute of Chemistry (SNIC) Industry Award in Synthetic Chemistry (2020)
Chemical Society of Japan Award for Young Chemists (2014)

Professor (Mrs.) Julie Banerji
PACFK, GB

Professor (Mrs.) Julie Banerji, FAScT, FISC, obtained her BSc (Honours in Chemistry, 1966), MSc (Chemistry, 1968) - standing first in both examinations. She received her PhD (Organic Chemistry with Prof. Asima Chatterjee, 1972) from the University of Calcutta. She worked As a Pool Officer in CSIR, then in CCRAS before joining the Chemistry Department of the University of Calcutta in 1978 as Lecturer. She became Professor at this Department in 1996. She was Head of Department of Chemistry (2000-2002), Deputy Programme Coordinator of the UGC Centre of Advanced Studies in Chemistry, Dean - Faculty of Home Science and Museology, member of Senate and Faculty Council. She worked in a post-doctoral position at University of East Anglia, Norwich, UK (1974-76), and as UNESCO-UNDP Fellow USA (1982) at Pennsylvania State University and other Universities. She has extensively visited several countries, and delivered invited lectures at a number of Universities and International Conferences. She retired from University of Calcutta in 2011. Since then she has been actively engaged in carrying out collaborative research, writing reviews and working for science popularisation through the Indian Science News Association.

She was a Council member of the Indian Science Congress Association, and Convenor of the Children's Science Congress Forum in 1996-97. She has a long association with the *Indian Science News Association*, serving as Council member, General Secretary and is now a Vice-President. She has received a number of academic awards including the prestigious R. C. Mehrotra Memorial Lifetime Achievement Award {10 Session of ISCA, 20}; Premchand Roychand Fellowship, Mouat Medal and Griffith Prize of the Calcutta University. She is a Fellow, West Bengal Academy of Science and Technology, and Fellow of the Indian Science Congress Association. She anchored the prestigious QUEST Programme of the National Television Network for a number of years.She has been engaged in research in different areas of Organic Chemistry since 1969: Study of Natural Products on all aspects; drug development from Indian Medicinal Plants; Heterocyclic Chemistry; Lewis acid catalysed reactions; [3+2] cycloadditions. She had Research collaboration with scientists in USA, UK, France, Switzerland, Germany, Japan and a number of Indian Universities and Institutes.She has published more than 150 papers, and has over 170 Abstracts in Proceedings of International and National Conferences/Symposia including several invited and plenary lectures.


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Prof. Pinaki Chaudhury, Dept. of Chemistry, University of Calcutta.

Prof. Pinaki Chaudhury is a Professor in the Department of Chemistry, University of Calcutta. He obtained his Ph. D. working with Prof. Sankar Prasad Bhattacharyya at the Department of Physical Chemistry, Indian Association for the Cultivation of Science. His area of interest is Theoretical Chemistry with the specific area being the use of stochastic algorithmic techniques in elucidating structural and dynamical features of atomic and molecular clusters.

Prof. Shoubhik Das, University of Bayreuth, Bayreuth, Germany

Prof. Shoubhik Das obtained his PhD under the guidance of Professor Matthias Beller in 2012 at Leibniz Institut of Catalysis (LIKAT), Germany and followed by this, he did postdoctoral research with Professor Matthew Gaunt at the University of Cambridge, UK and with Prof. Paul Dyson at the EPFL in Switzerland. He started his independent research career (habilitation) in the University of Göttingen, Germany in 2015 and after four years, he moved to the University of Antwerp as a tenure track professor. Since August 2023, he is a chair professor at the Department of Organic chemistry at the University of Bayreuth, Germany. His current research interests are the development of homogeneous and heterogeneous photo-/electrocatalysts and their applications into organic synthesis as well as fuel type molecules.

Awards:

Odysseus Award
Francqui lecturer award
EuChemS young investigator
JSP Fellowship
Liebig Fellowship
UK- India Education and Research Initiative (UKIERI) Fellowship

Professor Avijit Banerji
Retired Professor, University of Calcutta
Conference Chair, ICCHD-2025

Professor Avijit Banerji, FAScT, FISC, obtained his BSc (Honours in Chemistry, 1964), MSc (Chemistry, 1966) and PhD (Organic Chemistry with Prof. Asima Chatterjee, 1970) from the University of Calcutta. He joined the Chemistry Department of the University of Calcutta in 1972 as Lecturer, and became Professor in 1986. He was Head of Department of Chemistry (1996-98), Deputy Programme Coordinator then Programme Coordinator (2003-11) of the UGC Centre of Advanced Studies in Chemistry, Chairman - Undergraduate Board of Studies in Chemistry, member of Faculty Council and Senate. He worked as Nuffield Fellow at University of East Anglia, Norwich, UK (1974-76), and as UNESCO-UNDP Fellow USA (1982) at Pennsylvania State University and other Universities. He has extensively visited several countries, and delivered invited lectures at a number of Universities and International Conferences. After his retirement from University of Calcutta he was attached as Sir Asutosh Mookerjee Fellow (ISCA-DST) with the Central Ayurveda Research Institute of Drug Development, CCRAS, Kolkata (2016-2021).He was General Secretary, *Indian Science Congress Association* in 2006-2009, having previously served as Treasurer (2004-2006), and Sectional President in Chemistry (1996-1997). He has had a long association with the *Indian Chemical Society*, serving as Council member, Treasurer, Honorary Secretary (1990-1993) and Vice-President (1996-1997, 2000-2001). He represented the ICS in the *Federation of Asian Chemical Societies,* and was founder-member of the Board of *Asian Network on Research in Anti-Diabetic Plants* ***(ANRAP).***He has received a number of academic awards including the prestigious R. C. Mehrotra Memorial Lifetime Achievement Award {101^{st} Session of ISCA, 2014}; 15th Mukarram Khundker Memorial Lecture (1998 - *Dhaka University*); *Indian Chemical Society* - Basudev Banerjee Award (1991), P. K. Bose Memorial Award (1993). He was nominated Fellow, West Bengal Academy of Science and Technology (from 1990), and Fellow of the Indian Science Congress Association (2019). He has been engaged in research involving diverse area of Organic Chemistry since 1967: Study of Natural Products on all aspects; [3+2] cycloadditions; Heterocyclic Chemistry; Computational Chemistry; NMR studies; Single Electron Transfer Reactions. He has published more than 170 papers, and has over 190 Abstracts in Proceedings of International and National Conferences/Symposia including several invited and plenary lectures.

Dr. Sukhendu Vikas Mandal
Former professor IICB Kolkata

Dr. Sukhendu Vikas Mandal obtained his Ph. D. degree in chemistry from Calcutta University in 1979. He did his post-doctoral research at the University of Alberta (1979 – 1980) in Canada, the State University of New York at Stony Brook (1981 – 1983) and the National Research Council of Canada at Ottawa (1988 – 1989). He joined Chemistry Division, CSIR Indian Institute of Chemical Biology, Kolkata in 1983 and retired from the institute in 2013 as chief scientist. Fourteen students received Ph. D. degree under his supervision and he has 63 publications in reputed international journals in his credit.

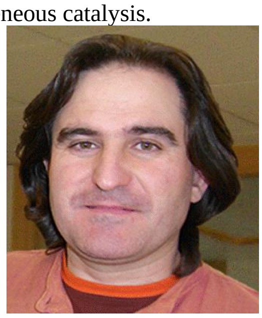
Prof. Nikhil Guchhait, Calcutta University, India

Professor Nikhil Guchhait did his doctoral research under late Prof. Mihir Chowdhury at Indian Association for the Cultivation of Science, Jadavpur. He worked as post doctoral fellow with Prof. Lionel Goodman at Rutgers University, USA, and as JSPS fellow with Prof. N. Mikami at Tohoku University, Japan. As a visiting faculty he worked with Prof. F. Lahmani at University of Paris Sud XI, France and with Nobel laureate Prof. Y. T. Lee at IAMS, Taiwan. Before joining as a faculty member in the Department of Chemistry, University of Calcutta he was faculty member at IIT Guwahati and at Visva Bharati, Shantiniketan

Prof. Ila received her ph.D. degree from IIT Kanpur (1968). After a postdoctoral stay with prof. R. L. Whistler at Purdue University, USA (1969), she joined Central drug Research Institute, Lucknow (1970) as research scientist. Togather with her husband Prof. H. Junjappa, also a chemistry professor, she moved to new North Eastern Hill University, Shillong in 1977, to establish a School of Chemistry there. She became professor in 1986, and joined the Department of Chemistry at IIT Kanpur, her alma mater, in 1995. After her superannuation (2007), she moved to Bangalore and joined Jubilant Biosys as 'principal advisor, medicinal chemistry' (2007-2009). In 2010 January, she moved to New Chemistry Unit, Jawahar lal Nehru Centre for Advanced Scientific Reserach (JNCASR) Bangalore, as INSA Senior Scientist (2010-2014) and presently continuing there as 'Hindustan Leverr research professor (2015 onward).Prof. Ila has been elected **fellow of Indian Academy of Science Bangalore** (FASc.) (1990) and **Indian National Science Academy (FNA) (2001)**. **She has been awarded Chemical Research Society of India, Life Time Achievement Award Gold Medal in (2019) and silver medal (2001), AV Ramarao Foundation prize in Chemistry(2001), Indian Chemical Society** medal. She has been Alexander von Humboldt Fellow (1984-1985, R. Gompper,Munich; 1998, 2000, 2001, 2003, 2016 with Prof. L. F. Tietze, Goettingen, 2004, 2005, 2010, 2011,2015 with Prof. Paul Knochel , LMU, Munich), Marie Curie Visiting Fellow (1995) at Uni of Cambridge, UK, , INSA exchange visitor in UK and France (1993, 1996), visiting professor (at Sevilla, Spain, 1999, USC, Los Angeles, 2002, University of Sendi,Japan , (2012).She has delivered several plenary and invited lectures in several international conferences aswell as National symposia.She has been co-author of more than **265** research publications in international journals and her research activities revolve around design and development of efficient new synthetic methods for biologically important molecules especially heterocycles. Her biography has been published in ***'Lilawati's Daughters'***, a book published by Indian Academy of Science bangalore (2008) on Indian Women Scientists and recently in ***'Vigyan Vidushi'*** a book published by Vigyan Prasar DST (2023), New Delhi on Indian women scientists on' Azadi ka Amrut Mahotsav'.

Prof. Mark Gandelman, Technion, Israel

Mark was born and raised in Moldova, and at the age of 18 he immigrated to Israel. He received a B.Sc. degree in chemistry in 1995 from Tel Aviv University, and a Ph.D. degree in 2003 from the Weizmann Institute of Science under the supervision of Prof. David Milstein. Holding the Rothschild fellowship, Mark performed his post-doctoral studies at Harvard University in the group of Prof. Eric N. Jacobsen. In 2005, he joined the Schulich Faculty of Chemistry in the Technion as an assistant professor and became a full professor in 2020. Mark holds the Abronson Family Chair in Chemistry. His research program encompasses studies in organometallic, organic and main group elements chemistry and homogeneous catalysis.



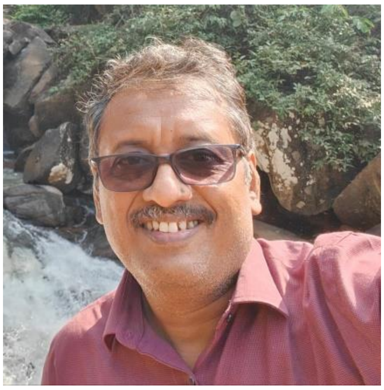
Dr. Ricardo Castarlenas, ISQCH-University of Zaragoza, Spain

Dr. Ricardo Castarlenas obtained his Ph.D. in 2001 from the University of Zaragoza under the guidance of Prof. Miguel A. Esteruelas working in the stoichiometric imination of alkynes with Osmium complexes. After postdoctoral studies with Prof. Pierre H. Dixneuf in the University of Rennes-1 (2001-2004), studying the olefin metathesis activity of Ruthenium-arene catalysts, he returns to University of Zaragoza (2004-2007) as associate researcher working in catalytic application of Osmium derivatives. Later, he become “Ramon y Cajal” researcher (2007-2012) and ARAID foundation senior research fellow (2012-2015). In 2016 he obtains a CSIC permanent research position in the ISQCH to develop Rhodium-NHC catalytic transformations. He was visiting Professor at the University of L’Aquila in Italy (2015).

Awards:

Young Research Prize of the Spanish Royal Society of Chemistry (2008)

Senior Research Prize of the Royal Academic Sciences of Zaragoza (2011)



Dr. Nilay Karchaudhuri, Associate Professor of Chemistry at Barrackpore Rastraguru Surendranath College, holds a Ph.D. (2008) from the University of Calcutta, an M.Sc. in Organic Chemistry (1995) from the same university, and a B.Sc. in Chemistry (Hons., 1993) from Ramakrishna Mission Vidyamandira, Belur Math. A recipient of the UGC-CSIR Junior Research Fellowship and Lectureship (1995), Dr. Karchaudhuri specializes in Green Chemistry, Organometallics, and Sustainable Materials. Since 2016, he has served as Associate Professor, contributing significantly to research, with 398 citations, an h-index of 11, and an i10-index of 11. Notable achievements include chairing a session at Commonwealth Chemistry (RSC, 2024), co-chairing Modern Perspectives of Advances in Chemical Science (MPACS, 2024), and serving as a member of the Board of Studies (UG) at West Bengal State University (2022–2024). He is a life member of IACS, Indian Chemical Society and was an affiliate member of Royal Society of Chemistry. One of his research works was included in “Greener Approaches to Undergraduate Chemistry Experiments” published by American Chemical Society to integrate “Green Chemistry” into the college chemistry curriculum.

Bimal Krishna Banik
Ph.D., C.Chem., F.R.S.C., F.I.C.S., F.I.S.R.O.S.E.T., F.R.S.C.S., F.I.C., Gold Medalist

Bimal Krishna Banik conducted his doctoral research at the Indian Association for the Cultivation of Science, Calcutta with Professor U. R. Ghatak. Then, he pursued postdoctoral research at Case Western Reserve University (USA) with Professor R. G. Salomon and Stevens Institute of Technology (USA) with Professor A. K. Bose. He was a Tenured Full Professor and First President's Endowed Professor in Science & Engineering at the University of Texas and the Vice-President of Research at the Community Health Systems of Texas. At present, Dr. Banik is a Full Professor, Deanship of Research at the Prince Mohammed Bin Fahd University, Kingdom of Saudi Arabia. Professor Banik has taught Chemistry to B. S., M. S., and Ph. D. Students in USA and Saudi Arabia Universities for many years. His class teaching skills are exceptionally strong and these are certified by several thousand students through their confidential written evaluations. He has developed new courses as a part of curriculum in the USA. In research, he has supervised approximately 300 students, 20 postdoctoral fellows, 7 Ph. D. research scientists and 28 university faculties. He has acted as the Advisor of two students' organizations that have 1400 students. Many of his students have completed Ph. D., D. Pharm. and M. D. degree from US Universities and have been working at national/international institutions, health centers and industries.Professor Banik has conducted synthetic organic chemistry and chemical biology research on cancers, antibiotics, catalysis and natural products. As the Principal Investigator (PI), he has been awarded $7.25 million in grants from USA NIH and USA NCI. Importantly, he has more than 740 publications (US patents, books, book chapters, papers, reviews, name reactions, perspectives and editorials) and 530 presentation abstracts. He has edited 12 and also authored 12 books. The number of citations of his publications is more than 10,000. Dr. Banik is ranked within the Top 2% Scientist every year since this program is initiated. He served as the PI of a joint green chemistry symposium between USA and India. He has chaired 20 symposiums at the American Chemical Society (ACS) National Meetings and over 2 dozen conferences at the National and International level, including 1 at the Nobel Prize Celebration. In the capacity of Chair, he has introduced about 300 Speakers. Dr. Banik is a Reviewer of 93, Editorial Board Member of 26, Editor-in-Chief of 12, Founder of 8, and Guest Editor of 10 research journals. As the Editor-in-Chief, he has recruited approximately 200 Associate Editors and Editorial Board Members. He is an Examiner of NSF, NCI, NIH, NRC, DOE, ACS and International grant applications; Reviewer of promotion & tenure of faculty of national and international universities; Examiner of doctoral theses; and Panel Member of US NSF and US NCI/NIH Funding Sections. He has served as the Chair/Member of more than 100 scientific committees. He was the Chair of the University of Texas M. D. Anderson Cancer Center's drug discovery symposiums and directed their US NCI funded analytical chemistry Core Laboratory. Dr. Banik was given the Indian Chemical Society's Life-Time Achievement Award; First President's Endowed Professorship at the University of Texas in 87 years; Mahatma Gandhi Pravasi Honor Medal from the UK Parliament; US National Society of Collegiate Scholars' Best Advisor Award for students; Professor P. K. Bose Endowment Medal; Dr. M. N. Ghosh Gold Medal; University of Texas Board of Regents' Outstanding Teaching Award; ACS Member Service Award; several Awards on top-cited Papers by Elsevier; and Best Researcher, Teacher and Mentor Awards by the UTPA. Dr. Banik was recognized/honored by numerous organizations including Burdwan University; Bejoy Narayan College; ACS News and SEED; Elsevier, RSC, US NCI-NIH-US Research Foundations; Times of India; AAAS; Stevens Institute of Technology; India and US Newspapers; Bentham Publisher; and Down to the Earth Magazine. Dr. Banik received approximately 200 invitations to deliver keynote and distinguished lectures in 35 countries. He hosted distinguished professionals including Nobel Prize Winners, US White House Secretary, US Senators, and Editors of Top ACS Journals.

Dr. Ralf Jackstell, Leibniz Institut für Katalyse, Germany

Dr. R. Jackstell, studied mathematics and chemistry from 1989-1994. From 1995-1998 made his research on organophosphorous Chemistry and obtained his Ph.D. in 1998 from the University of Rostock under the guidance of Dr. Arno Balszuweit. After postdoctoral studies at the Institute of organic Catalysis(IFOK) with Professor M. Beller he became a topic leader (Organic Bulk Chemicals, now Applied Carbonylations) 2002 in the same workgroup (Applied Homogeneous Catalysis) at the Leibniz Institute for Catalysis(LIKAT).During this time he was an author of app.175 publications and inventor of >120 patents.

Professor D. Mal, IIT Kharagpur, India

Professor D. Mal, an alumnus of the Calcutta University**,** received PhD degree (University of Missouri-Kansas City, Mentor: Professor Layton L. McCoy) in 1981. Following 3 years of post-doctoral research with Professor Frank M Hauser at the Oregon Graduate Center, USA, he joined Bose Institute, Kolkata in 1984 as a lecturer. In 1987, he joined IIT Kharagpur as a reader, superannuating in 2017 as a Professor (Higher Administrative Grade). During 2011-2014, he served as the head of the department. For a semester in 1998, he was a visiting professor at SUNY Albany, USA. He has published over 130 international research publications, and mentored 32 PhD theses. Post retirement, he taught at Vidyasagar University, Diamond Harbor Women University, and IISER Berhampur as a visiting professor during 2018-2023.

His research interests were focused on annulation strategies and pericyclic reactions for the total synthesis of natural products (anthracyclines, angucyclines, quinones, coumarins, isocoumarins, lignans, carbazoles, etc.). He has published the book "**Anionic annulations in organic synthesis** (**2018**, **Elsevier**)". He has also developed a 40-lecture NPTEL video course: Heterocyclic Chemistry (**2014, YouTube**).

He is a recipient of Phi Kappa Phi Honor certificate (University of Missouri, USA). He is a Fellow of West Bengal Academy of Science and Technology (2012) as well as a Fellow of the Royal Society of Chemistry, UK.

Prof. Sasanka Sekhar Mohanta, Department of Chemistry, University of Calcutta, India

Professor Sasanka Sekhar Mohanta completed his B. Sc. (Chemistry Honours) from Ramakrishna Mission Residential College Narendrapur under University of Calcutta and M. Sc. from University of Calcutta. He obtained his Ph.D. (Sc.) degree from Indian Association for the Cultivation of Science (Through Jadavpur University), Kolkata. He worked as a Lecturer in Chemistry in Ramakrishna Mission Residential College Narendrapur for few months and then moved to Department of Chemistry, University of Calcutta, as a Lecturer. Since 1997, he has been serving University of Calcutta as a faculty member. He did his postdoctoral work in Tamkang University, Taiwan. He guided 18 Ph. D. students, published around 125 papers in journals of international repute and completed or is running four major projects funded by DST, Government of India. The foci of his research area are Molecular Magnetism, Crystal Engineering, Bioinorganic Chemistry and Chemosensors – both experimental and theoretical.

Pierre H. Dixneuf, Emeritus Professor, University of Rennes, France

Pierre H. Dixneuf did his PhD on Ferrocene chemistry with Prof Dabard and postdoc in England on NHCarbene complexes with prof Lappert. He started to create a Catalysis group as a professor in Rennes in 1985. He successively developed selective catalytic transformations of alkynes, incorporation of CO_2, ruthenium-vinylidenes and -allenylidenes in catalysis, enantioselective hydrogenation for industry with chiral Ru catalysts, new alkene metathesis catalysts for the transformation of plant oil derivatives. He is now contributing since 2007 to catalytic C–H bond activation/functionalization, using mostly Ru(II) and Rh(I) catalysts recently for the modification of ligands and heterocycles via interrupted reduction. He was Scientific Deputy Director of CNRS Chemistry in Paris (1996-1999), he founded the CNRS-University of Rennes research Institut de chimie de Rennes in 2000 and was University of Rennes vice-president for research (2001-2004). He has co-authored 490 publications and reviews, 120 dealing with Green C-H bond modifications, and co-edited 7 books. He received international prizes from Germany, Italy, Spain, Portugal, R P China, Taiwan, India, and from French académie des sciences. He is the foreign member of 4 academies of sciences in Europe and India.

Professor Isabelle Chataigner obtained her Ph.D. in 1997 from the university of Nantes under the guidance of Dr. Jean Villiéras. After postdoctoral studies with Professor Cesare Gennari at the University of Milan (1998-1999), she started her career at the University of Rouen Normandie as associate professor. She obtained her Habilitation from this university in 2009 and became Full Professor at the University of Rouen Normandie in 2013. She has additionally, since 2017, a CNRS temporary position at the Laboratoire de Chimie Théorique, Sorbonne Université, Paris, France.Visiting Professorships at Tohoku University (Sendai, Japan, 2016), at Osaka Prefecture University (Sakai, Japan, 2018).

Prof. Dr. Manas Chakrabarty
Retired Professor Bose Institute

Manas Chakrabarty, born on 7th January, 1948, obtained M.Sc. (Chemistry degree) in 1968) and Ph.D. (Sc.) degree in 1974, both from Calcutta University. His Doctoral Supervisor was Late Professor (Mrs.) Asima Chatterjee. After a brief spell of Postdoctoral research (1976-1978) on the Synthesis of Porphyrins with Late Professor A.H. Jackson in the Cardiff University, Wales, U.K., he worked in the fields of Chemistry of Plant and Marine Natural Products and in the R. & D. Division of an Indo-Holland Industry in Kolkata. Finally, he joined Bose Institute, Kolkata as a Faculty member in Chemistry, from where he retired in 2008 and as an Emeritus Scientist (CSIR) in 2013. His fields of specialisation are Chemistry of Natural Products, Synthetic Heterocyclic Chemistry and Green Chemistry. He supervised 12 Doctoral students and has 80 scientific publications in many national and international journals in India and abroad. He presented Papers and Chaired sessions in a number of National and International Symposia / Conferences in India.

He has had been teaching at M.Sc. (Chemistry) / B. Tech. (Polymer Sc. & Technol.) classes at various Universities and Colleges and at M.S. (Pharmacy) classes in NIPER, Kolkata. He is a Fellow of The Royal Society of Chemistry, U.K., Indian Chemical Society, Indian Science Congress Association, IACS, and Zoological Society, all in Kolkata. He is a Member of the Editorial Board of *Arkivoc* (USA) and *Science and Culture* of the Indian Science News Association (in Science College, Rajabazar campus, Kolkata) where he is an Honorary Secretary. He has a number of publications on popular science topics and scientists in *Anandabazar Patrika, Science and Culture, Jnan-O-Bignan, Monthly Bulletin of The Asiatic Society, Kolkata, 4 No.. Platform (webgine), Scientifica Communica and Bignan Kahon (e-Papers)*, etc.

Prof. Amrita Chatterjee, BITS Pilani KK Birla Goa Campus, India

Professor Amrita Chatterjee obtained her Ph.D. in 2006 from Jadavpur University, India under the guidance of Late Professor P. K Bhattacharya. After postdoctoral studies with Professor Kyo Han Ahn at POSTECH, South Korea (2006-2009), she started her independent career as assistant professor at BITS Pilani KK Birla Goa campus, and she became full professor in 2021.

Her current research interests are molecular sensor using AIEgens, fluorescent carbon nano materials such as carbon dots, graphene quantum dots, graphene oxide, and polydiacetylene moiety, and green chemistry. She has more than 85 publications and two patents to her credit.

Prof. A. Stephen K. Hashmi, Heidelberg University, Germany

Professor A. Stephen K. Hashmi obtained his Ph.D. in 1991 from LMU Munich under the guidance of ProfessorG. Szeimies. After postdoctoral studies with Professor B. M. Trost at Stanford University (1991-1993), he started his independent career with Prof. J. Mulzer at Free University of Berlin, University of Frankfurt and University of Vienna, he obtained his Habilitation from Frankfurt University and was visiting Scientist at the University of Tasmania.After Professorships at Marburg University and Stuttgart University (Associate Professor), he became Full Professor at Heidelberg University in 2007.

Visiting Professorships at Gakushuin University (Tokyo, Japan, 2008), at Milan University (Milan, Italy, 2010), Tokyo Institute of Technology (Tokyo, Japan, 2012) and Keio University (Tokyo, Japan, 2015).

Awards:

Dr. Otto Röhm Memorial Fellowship
Karl-Ziegler Memorial Fellowship
ORCHEM Prize for natural sciences of the German Chemical Society
Hector Research Prize 2010
Prof. Dr. Malte Brasholz, University of Rostock, Germany

Professor Malte Brasholz studied Chemistry at Freie Universität Berlin and obtained his PhD from the same institution in 2007, under the guidance of Prof. Hans-Ulrich Reissig. A short-term stay in the laboratory of Prof. Hisashi Yamamoto at the University of Chicago in 2008 was followed by one year of postdoctoral research in the group of Prof. Steven V. Ley at the University of Cambridge. A second year of postdoctoral studies led Malte to Australia, where he worked at CSIRO Molecular and Health Technologies in association with Prof. Andrew B. Holmes at the University of Melbourne. In 2010, he was appointed Research Scientist at CSIRO Materials Science and Engineering. From 2012, Malte established an independent research group at the Institute of Chemistry at the University of Hamburg. Since 2017 he is Professor of Organic Chemistry at the University of Rostock.

Dr. Jhimli Sengupta, West Bengal State University, Kolkata.

Dr. Jhimli Sengupta obtained both her B.Sc. (1998) and M.Sc. (2000) degrees from University of Calcutta. In M.Sc., she was a gold medalist in her discipline. She subsequently moved to Indian Institute of Chemical Biology to carry out her doctoral studies, and was awarded her Ph.D. in 2007. From 2007 to 2008, she continued her postdoctoral research and then joined West Bengal State University as an Assistant Professor in 2009. Her research interests include the synthesis of novel C2-symmetric macrocyclic nucleosides, the study of their supramolecular complexes, and the synthesis of enantiopure chiral molecules from carbohydrates.

Awards:

- Gold Medal for securing highest marks in Chemistry in M.Sc. Examination, Calcutta University, Kolkata, India.
- Selected for Shyama Prasad Mukherjee fellowship interview for securing place among the top 20% awardees in Chemical Sciences merit list of the NET (2000) examination.

Prof. Aparna De, Principal, South Calcutta Girls' College, Kolkata, India

Starting the journey in the path of Chemistry from Presidency College Kolkata, Prof. Aparna De received the Presidency College Chemistry Alumni Awards 1991 (Princeton University) and Summer Research Fellowship of Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, twice (1992 & 1993) during her undergraduate studies. She completed her M.Sc. and Ph.D. from the University of Calcutta. Her research interest includes microwave chemistry, organometallics and green chemistry. One of the research works was included in "Greener Approaches to Undergraduate Chemistry Experiments" published by American Chemical Society (2002) to integrate "Green Chemistry" into the college chemistry curriculum. She received Sir P. C. Ray Research Award of University of Calcutta (1999-2000). Since 1999 she is associated with undergraduate teaching. Besides her academic and research work in Chemistry with around 600 citations, she joined South Calcutta Girls' College as the Principal in 2016 to contribute to the women education. The college is now upgraded to Grade A (NAAC accreditation). She received D. Meheta National Education Awards, Education Leadership Award, 2019 and Golden Aim Awards for Excellence and Leadership in Education, 2021. Outstanding Teacher Award of 2021-22 by Presidency University, Bengaluru was awarded to her. She is now working with Sustainable Development Goals 4 and 13.

Plenary Lectures

PL-1

Design and Development of New Synthetic Methods for Biologically Important Heterocycles: Few Reminiscences and Reflections

H. Ila
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, 560064, India
E- mail: hila@jncasr.ac.in

Abstract

In recent years, some of the important issues faced in the synthesis and production of organic compounds are search for environmentally benign methods, the preservation of resources, the handling of waste and above all, the increase in efficiency. Consequently, synthetic organic chemists are faced with challenge to discover concise, elegant, conceptually novel synthetic and environmentally benign routes which has become a steadily increasing driving force both in academia and industry. Therefore, they have sought and devised fruitful strategies that inevitably tackle the very fundamental principle of efficacy and efficiency.'Small molecule heterocycles' play important role in both drug discovery and material science research providing one of the richest source of diversity, besides serving as rigid scaffolds for further display of a range of functionalities. The present lecture will focus on our several years of research experience directed towards design and development of new, efficient and concise routes for biologically important five and six membered heterocycles. Some of the recent work involving synthesis of heterocycles such as indoles, benzothiophenes, benzofurans, substituted thiophenes, pyrazoles, imidazoles, oxazoles, thiazoles, isoxazoles etc., involving transition metal catalyzed cross coupling and atom economy reactions such as C-H activation, transition metal free coupling reactions, domino reactions and multicomponent one-pot reactions, from easily accessibly organosulfur building blocks will also be presented.Some of our recent results involving bio-inspired synthesis of few of non-natural indole alkaloids using β-carboline derived enaminone precursors will also be presented.

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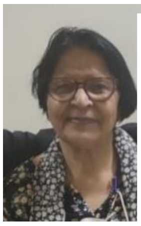
Personal Profile

Prof. Ila received her ph.D. degree from IIT Kanpur (1968). After a postdoctoral stay with prof. R. L. Whistler at Purdue University, USA (1969), she joined Central drug Research Institute, Lucknow (1970) as research scientist. Togather with her husband Prof. H. Junjappa, also a chemistry professor, she moved to new North Eastern Hill University, Shillong in 1977, to establish a School of Chemistry there. She became professor in 1986, and joined the Department of Chemistry at IIT Kanpur, her alma mater, in 1995. After her superannuation (2007), she moved to Bangalore and joined Jubilant Biosys as 'principal advisor, medicinal chemistry' (2007-2009). In 2010 January, she moved to New Chemistry Unit, Jawahar lal Nehru Centre for Advanced Scientific Reserach (JNCASR) Bangalore, as INSA Senior Scientist (2010-2014) and presently continuing there as 'Hindustan Leverr research professor (2015 onward).Prof. Ila has been elected fellow of Indian Academy of Science Bangalore (FASc.) (1990) and Indian National Science Academy (FNA) (2001). She has been awarded Chemical Research Society of India, Life Time Achievement Award Gold Medal in (2019) and silver medal (2001), AV Ramarao Foundation prize in Chemistry(2001), Indian Chemical Society medal. She has been Alexander von Humboldt Fellow (1984-1985, R. Gompper,Munich; 1998, 2000, 2001, 2003, 2016 with Prof. L. F. Tietze, Goettingen, 2004, 2005, 2010, 2011,2015 with Prof. Paul Knochel , LMU, Munich), Marie Curie Visiting Fellow (1995) at Uni of Cambridge, UK, , INSA exchange visitor in UK and France (1993, 1996), visiting professor (at Sevilla, Spain, 1999, USC, Los Angeles, 2002, University of Sendi,Japan , (2012).She has delivered several plenary and invited lectures in several international conferences aswell as National symposia.She has been co-author of more than 265 research publications in international journals and her research activities revolve around design and development of efficient new synthetic methods for biologically important molecules especially heterocycles . Her biography has been published in 'Lilawati's Daughters', a book published by Indian Academy of Science bangalore (2008) on Indian Women Scientists and recently in 'Vigyan Vidushi' a book published by Vigyan Prasar DST (2023), New Delhi on Indian women scientists on' Azadi ka Amrut Mahotsav'.



Prof. H. Ila
Jawaharlal Nehru Centre for Advanced
Scientific Research,
Bangalore, 560064, India
E- mail: hila@jncasr.ac.in

PL-2

Discovery of New Beta-Lactams as Novel Anticancer Agents

Bimal Krishna Banik
Professor
Deanship of Research Development, Prince Mohammad Bin Fahd University, Kingdom of Saudi Arabia; Former:
Tenured Full Professor & First President’s Endowed Professor, Science & Engineering, University of Texas, USA;
Former: Vice President of Research & Education Development, Community Health Systems of Texas, USA;
Designated as “Distinguished Researcher” and “Distinguished Scientist”;
E-mail: bimalbanik10@gmail.com

Abstract

Many β-lactams are used as antibiotics. We hypothesized that suitably designed β-lactams may have anticancer activity as well. To test the hypothesis, synthesis of new β-lactams derived from polyaromatic compounds is conducted. Diastereoselectivity and enantioselectivity of these methods are investigated.[1, 2] An unprecedented stereoselectivity of the β-lactam formation is observed. The mechanism of these reactions is investigated. The new β-lactams are tested against numerous human cancer cells in vitro and in vivo. Notably, the anticancer activity of a few compounds is found superior to that of clinically active drugs. Selective differences in cytotoxicity are evident in ovary, breast, liver, colon, pancreas, prostate, skin and blood cancer cell lines. Some active anticancer β-lactams in this series target specific genes. Ames assay, topoisomerase inhibition and cell cycles of the active β-lactams are investigated. The lead β-lactams arrest cell cycle at the G2/M checkpoint and inhibit protein synthesis. Several significant chemical manipulations of the functionalized β-lactams are performed for the stereocontrolled asymmetric synthesis of structurally complex and novel multicyclic compounds. These are important protein kinase inhibitors, extremely useful targets in cancer chemotherapy.

Acknowledgements:

B. K. Banik thanks USA NIH, USA NCI and Texas Private Foundations for financially supporting this research. Thanks are due to his 28 postdoctoral fellows/research scientists and hundreds of high school, B. S., M. S. and Ph. D. students who have participated in this research.

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1. For some of our books and patents on this topic, see: (a) Banik, B. K. “Heterocyclic Scaffolds I. Top. Heterocycl. Chem., Springer, 2010; (b) Banik, B. K. “β-Lactams: Synthesis and Biological Evaluation”, Top. Heterocycl. Chem., Springer, 2012; (c) Banik, B. K. “Beta Lactams: Novel Synthetic Pathways and Applications”, Springer Nature, 2017; (d) Das, A.; Banik, B. K. “Microwave in Chemistry Applications: Fundamental, Methods and Future Trends”, Elsevier, 2021; (e) Banik, B. K. “Green and Sustainable Approaches in Medicinal Chemistry-Methods-Volume 1 and Applications-Volume 2”, Elsevier, 2024; (f) Banik, B. K. and A. Das “Chemistry and Biology of Beta-Lactams”, CRC, 2024; (g) Becker, F. F.; Banik, B. K. “Polycyclic β-Lactam Derivatives for the Treatment of Cancer”, US Patent, Number US8946409, 2015; (h) Becker; F. F.; Banik, B. K. “Polycyclic β-Lactam Derivatives for the Treatment of Cancer”, World Patent, Number WO103456A2, 2012.

2. B. K. Banik et al. published 150 papers, US and World patents, reviews, perspectives, books and book chapters on Beta-Lactams (out of his more than Seven Hundred published/accepted publications). For some of these, see the following journals: Angew. Chem. Int. Edn. Engl., Tetrahedron Symposium-in-Print, Tetrahedron Lett., Eur. J. Med. Chem., Synlett, Synthesis, RSC Advance, J. Med. Chem., Bioorg. & Med. Chem. Lett, Bioorg. Med. Chem., J. Org, Chem., Molecules, Frontier, Current Med. Chem., Aus. J. Chem., Rus. Chem. Bulletin, Heterocycles, J. Chem. Soc. Perkin Trans, ChemSelect, Future Med. Chem., J. Ind. Chem. Soc., and Catalysis Rev. For some of his publications, please see the books published by Springer Nature, Elsevier, CRC, Nova, ICS, De Gruyter, Springer and Wiley

Personal Profile

Bimal Krishna Banik conducted his doctoral research at the Indian Association for the Cultivation of Science, Calcutta with Professor U. R. Ghatak. Then, he pursued postdoctoral research at Case Western Reserve University (USA) with Professor R. G. Salomon and Stevens Institute of Technology (USA) with Professor A. K. Bose. He was a Tenured Full Professor and First President’s Endowed Professor in Science & Engineering at the University of Texas and the Vice-President of Research at the Community Health Systems of Texas. At present, Dr. Banik is a Full Professor, Deanship of Research at the Prince Mohammed Bin Fahd University, Kingdom of Saudi Arabia. Professor Banik has taught Chemistry to B. S., M. S., and Ph. D. Students in USA and Saudi Arabia Universities for many years. His class teaching skills are exceptionally strong and these are certified by several thousand students through their confidential written evaluations. He has developed new courses as a part of curriculum in the USA. In research, he has supervised approximately 300 students, 20 postdoctoral fellows, 7 Ph. D. research scientists and 28 university faculties. He has acted as the Advisor of two students’ organizations that have 1400 students. Many of his students have completed Ph. D., D. Pharm. and M. D. degree from US Universities and have been working at national/international institutions, health centers and industries. Professor Banik has conducted synthetic organic chemistry and chemical biology research on cancers, antibiotics, catalysis and natural products. As the Principal Investigator (PI), he has been awarded $7.25 million in grants from USA NIH and USA NCI. Importantly, he has more than 740 publications (US patents, books, book chapters, papers, reviews, name reactions, perspectives and editorials) and 530 presentation abstracts. He has edited 12 and also authored 12 books. The number of citations of his publications is more than 10,000. Dr. Banik is ranked within the Top 2% Scientist every year since this program is initiated. He served as the PI of a joint green chemistry symposium between USA and India. He has chaired 20 symposiums at the American Chemical Society (ACS) National Meetings and over 2 dozen conferences at the National and International level, including 1 at the Nobel Prize Celebration. In the capacity of Chair, he has introduced about 300 Speakers. Dr. Banik is a Reviewer of 93, Editorial Board Member of 26, Editor-in-Chief of 12, Founder of 8, and Guest Editor of 10 research journals. As the Editor-in-Chief, he has recruited approximately 200 Associate Editors and Editorial Board Members. He is an Examiner of NSF, NCI, NIH, NRC, DOE, ACS and International grant applications; Reviewer of promotion & tenure of faculty of national and international universities; Examiner of doctoral theses; and Panel Member of US NSF and US NCI/NIH Funding Sections. He has served as the Chair/Member of more than 100 scientific committees. He was the Chair of the University of Texas M. D. Anderson Cancer Center’s drug discovery symposiums and directed their US NCI funded analytical chemistry Core Laboratory. Dr. Banik was given the Indian Chemical Society’s Life-Time Achievement Award; First President’s Endowed Professorship at the University of Texas in 87 years; Mahatma Gandhi Pravasi Honor Medal from the UK Parliament; US National Society of Collegiate Scholars’ Best Advisor Award for students; Professor P. K. Bose Endowment Medal; Dr. M. N. Ghosh Gold Medal; University of Texas Board of Regents’ Outstanding Teaching Award; ACS Member Service Award; several Awards on top-cited Papers by Elsevier; and Best Researcher, Teacher and Mentor Awards by the UTPA. Dr. Banik was recognized/honored by numerous organizations including Burdwan University; Bejoy Narayan College; ACS News and SEED; Elsevier, RSC, US NCI-NIH-US Research Foundations; Times of India; AAAS; Stevens Institute of Technology; India and US Newspapers; Bentham Publisher; and Down to the Earth Magazine. Dr. Banik received approximately 200 invitations to deliver keynote and distinguished lectures in 35 countries. He hosted distinguished professionals including Nobel Prize Winners, US White House Secretary, US Senators, and Editors of Top ACS Journals.

Prof. Bimal Krishna Banik,
Prince Mohammad Bin Fahd University,
Kingdom of Saudi Arabia
E-mail: bimalbanik10@gmail.com

PL-3

Catalytic Functionalisations of Phosphine C-H bonds and New reactions of Interrupted Reduction Intermediates

Pierre H. Dixneuf
Institute of Chemical Sciences of Rennes, UMR CNRS 6226,
University of Rennes, Rennes, France
E-mail: pierre.dixneuf@univ-rennes.fr

Abstract

Phosphines are key ligands to create the catalytic activity of molecular metal complexes for numerous catalytic reactions, useful in industry. Fast modifications of pyridines and phosphines via C-H bond activation/functionalization can easily lead to more active catalysts.Interrupted reductions of N-heteroarenes or nitroarenes allow fast reactions of reduction intermediates leading to innovative syntheses.The lecture will present the innovations and green processes recently discovered.i) Pyridines and Phosphines-Ruthenium(II) catalysts in water can promote sp^2C-H bond activation to produce hexa(heteroaryl)benzenes [1] and functionalisations of arylphosphine oxides[2]. -Rhodium(I) catalysts can promote the regioselective difunctionalisation of the biaryl group of phosphines[3,4] Increased activity of Metal-Phosphine Catalysts will be demonstrated.[3,4]ii) New reactions of interrupted reduction intermediates and innovations in synthesis-Ruthenium(II) catalysts can be driven for partial reduction of N-Heteroarenes for diastereoselective Annulation of Azaarenes in methanol and formaldehydes[5]. Iridium based catalyst allows partial reduction of heterocycles leading to γ-AminoAcids in the presence of 1,2-Dicarbonyls.[6]Simply made Heterogeneous Cobalt Catalysts allow selective first step hydrogenation of abundant and cheap Nitroarenes, with HCO_2H, leading to 1,3-diaryl imidazolines, NHC precursors, [7] Functional Ethane-1,2-diamines,[8] or Lactams.[9]

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9. Jia-Lu Sun, H. Jiang, P. H. Dixneuf, Min Zhang J. Am. Chem. Soc. 2024, 146, 11289−11298

Personal Profile

Pierre H. Dixneuf did his PhD on Ferrocene chemistry with Prof Dabard and postdoc in England on NHCarbene complexes with prof Lappert. He started to create a Catalysis group as a professor in Rennes in 1985. He successively developed selective catalytic transformations of alkynes, incorporation of CO2, ruthenium-vinylidenes and -allenylidenes in catalysis, enantioselective hydrogenation for industry with chiral Ru catalysts, new alkene metathesis catalysts for the transformation of plant oil derivatives. He is now contributing since 2007 to catalytic C–H bond activation/functionalization, using mostly Ru(II) and Rh(I) catalysts recently for the modification of ligands and heterocycles via interrupted reduction. He was Scientific Deputy Director of CNRS Chemistry in Paris (1996-1999), he founded the CNRS-University of Rennes research Institut de chimie de Rennes in 2000 and was University of Rennes vice-president for research (2001-2004). He has co-authored 490 publications and reviews, 120 dealing with Green C-H bond modifications, and co-edited 7 books. He received international prizes from Germany, Italy, Spain, Portugal, R P China, Taiwan, India, and from French académie des sciences. He is the foreign member of 4 academies of sciences in Europe and India.

Pierre H. Dixneuf
Emeritus Professor,
University of Rennes, France
E-mail: pierre.dixneuf@univ-rennes.fr

PL-4

Research and Development in Crop Protection – Idea to Market

Bhanu M Narayan
Executive Director
Syngenta Biosciences Pvt Ltd, Research and Technology center; Santa Monica works, Corlim Goa
E-mail: bhanu.manjunath@syngenta.com

Abstract

Syngenta Biosciences has experienced significant growth over the past two decades, evolving into a major contributor to the chemistry aspect of Agrochemical Active Ingredients development. This contribution has been instrumental in driving the growth of the Syngenta Group innovation. The presentation today will focus on the journey from initial lead to marketed product for two of our blockbuster molecules that have recently been introduced globally, including in India.

The talk will begin by providing an overview of Syngenta Biosciences' growth trajectory and its pivotal role within the Syngenta Group. The talk will then delve into detailed case studies of our two blockbuster molecules, exploring their development process from initial discovery through to market introduction. This will include discussions on the challenges faced and overcome during each stage of development. A key aspect of our success has been our commitment to continuous improvement. We'll highlight our ongoing efforts to enhance research methodologies, optimize processes, adopt new technologies, and foster effective collaborations. These initiatives have been crucial in maintaining our competitive edge in the rapidly evolving field of crop protection.

Central to our operations is an unwavering focus on Health, Safety, and Environment (HSE). We'll discuss how HSE considerations are deeply integrated into our R&D processes, influencing every stage of product development and manufacturing. We'll share some of our success stories and achievements in this critical area. The presentation will also showcase how these efforts have contributed to establishing Syngenta Biosciences as a centre of excellence in Chemistry and Analytical Sciences. The talk will outline our key areas of expertise, notable achievements, and advanced capabilities that set us apart in the industry. Finally, the talk will focus towards the future, discussing emerging trends in crop protection R&D and Syngenta Biosciences' strategic plans to address these developments. It will conclude by emphasizing the critical role of R&D in crop protection and Syngenta Biosciences' ongoing commitment to shaping the future of agriculture through innovative solutions. This presentation aims to provide a comprehensive overview of our R&D process, from the initial idea to market introduction, highlighting our commitment to excellence, innovation, and sustainability in crop protection.

Personal Profile

Dr Bhanu M N has extensive experience in research and development of pharmaceuticals and agrochemicals, spanning over 30 years, and positions him as a seasoned professional in the industry. He has received his M pharmacy Degree from the Institute of Chemical Technology (ICT) Mumbai and Ph.D. in Chemistry from Jawaharlal Nehru Technological University (JNTU) Hyderabad, working at IICT, Hyderabad, under the guidance of Padma Bhushan Dr. A V Rama Rao. He has also completed The Post Graduate Diploma in Intellectual Property Management from the National Law School Bangalore and has been certified as a lead auditor on Environment, Occupational Health, and Safety systems. He has published 12 research papers and has 30 process patents applied or granted. After working in various roles in the pharmaceutical Research and development field, he currently heads the research and technology centre for Syngenta Biosciences Pvt Ltd, as its executive director, which is a subsidiary of Syngenta AG, a leading global Agrochemical company. His expertise and skill set demonstrate a well-rounded and comprehensive understanding of the pharmaceutical and chemical/Agrochemical industry. His strong business acumen, combined with technical expertise, allows him to bridge the gap between scientific innovation and commercial viability which is a valuable skill set, especially in roles that require strategic decision-making and alignment with business objectives.

His is also an expert in Environment, Health, and Safety (EHS) Aligning EHS practises with the growing importance of sustainability in the chemical and pharmaceutical sectors an expertise which has increasingly valuable impact in shaping corporate responsibility and regulatory compliance.

1.Member of Research Governing Council for the Goa State Research Foundation

2.Recognised PhD guide for Goa university and Mangalore University. Guided 2 students successfully to complete their PhD (chemistry)from Mangalore University.

3.Member, Advisory committee, Academic Unit, Sept 2015, Department of Chemistry, National Institute of technology, Surathkal,

4.NABET Accredited lead auditor on Environment, occupational health and safety systems (EHSMS 14001-2015& OHSAS 18001-2007).

Bhanu Manjunath Narayan
DIRECTOR R & T CENTRE,
Syngenta Biosciences Pvt Ltd
Email: bhanu.manjunath@syngenta.com

PL-5

Remote Regio- and Enantioselective C(sp^2)–H Activation: Substrate vs Catalyst Control

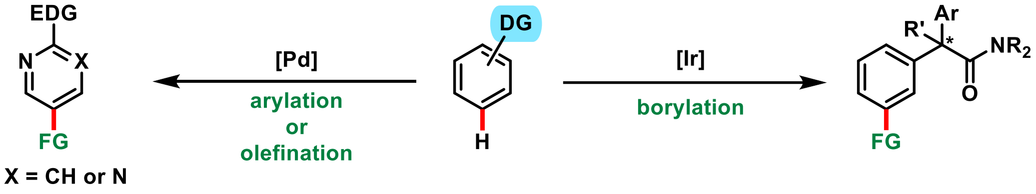
Netai Aditya, Animesh Das, and **Biplab Maji***
Department of Chemical Sciences, Indian Institute of Science Education and Research Kolkata
Mohanpur 741246, WB, India
Email:bm@iiserkol.ac.in

Abstract

Over the last few decades, organic chemists have paid meticulous attention in functionalizing organic molecules through step- and atom-economical C–H activation pathways. To be useful, the methodology must be regioselective to avoid time- and energy-intensive separation techniques. In this context, regioselective remote C–H activation of substrates having native directing group has been one of the most challenging tasks in the field. These challenges can be overcome through engineering the metal catalysts deployed.

The C−H functionalization of azine rings, such as pyridines or pyrimidines, remains challenging owing to the strong σ-coordination of the nitrogen center with the transition metal catalyst. Native functional groups such as NR_2 (amine) and OR (alkoxy) can activate the *para*-position of these azines for selective metalation. Our recent contributions on a variety of *para*-C−H bond activation and functionalization of heteroarenes using this electronics-controlled approach will be discussed.

This talk will further chronicle the development of a multifunctional catalytic system of regio- and enantioselective activation of remote C(*sp*^{2})–H bonds overcoming the challenges associated it. A chiral 2,2’-bipyridine ligand analogue has been devised for iridium-catalyzed enantioselective *meta*-C−H borylation of diarylacetic acid derived amides.



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Personal Profile

1987: Born, Howrah, India
2007: B.Sc. University of Calcutta (Chemistry Hons.)
2009: M.Sc. Indian Institute of Technology Kanpur (Chemistry)
2012: PhD Ludwig Maximillan Universität Munich, Supervisor: Prof. Herbert Mayr
2013-2015: Postdoc: Chubu University, Mentor: Prof. Hisashi Yamamoto
2016: Alexander von Humboldt fellow: Westfälische Wilhelms-Universität Münster, Mentor: Prof. Frank Glorius
2016-2021: Assistant Professor, Indian Institute of Science Education and Research Kolkata
2021-: Associate Professor, Indian Institute of Science Education and Research Kolkata

Research focus: Organic synthesis, catalysis, and mechanistic studies.
Awards:
2024: Chirantan Rasayan Sanstha® (CRS) Bronze Medal (2024)
2024: Associate of the West Bengal Academy of Science & Technology (WAST)
2021: "2021 Young Investigator Award ", Sponsored by Molecules
2021: Merck Young Scientist Award (runner-up) in Chemical Science
2021: INSA Medal for Young Scientists
2021: Associate of the Indian Academy of Sciences (IASc)
2020: NASI-Young Scientist Platinum Jubilee Award (2020) in Chemical Sciences
2019: Thieme Journal Award

Dr. Biplab Maji
Associate Professor
Department of Chemical Sciences
Indian Institute of Science Education and Research Kolkata
Email:bm@iiserkol.ac.in

PL-6

C-H functionalization to heterocycles and heteroarenes

Subhabrata Sen
Department of Chemistry, School of Natural Science, Shiv Nadar Institution of Eminence Deemed to be University, Dadri, Chithera, Gautam Buddha Nagar, UP 201314, India. Email: subhabrata.sen@snu.edu.in

Abstract

Functionalizing the C-H bond of organic molecules is a fundamental concept that is leveraged to develop numerous heterocycles and heteroarenes. Our research group has been involved in functionalizing various heterocycles and heteroarenes under thermal, photolytic and electro photolytic reaction conditions. My talk will encompass discussion of these efforts that have evolved over time to develop numerous organic transformations to afford various chemical building blocks with applications in various fields including medicinal chemistry and water treatment.

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Personal Profile

Professor Subhabrata Sen obtained his Ph.D. in 2001 from the University of Missouri, Columbia, MO, USA under the guidance of Professor Shon R. Pulley. After postdoctoral studies with Professor A. I. Meyers at Colorado State University (2001-2002), he started his industrial career in Chemocentryx Inc., Mt. View California, USA. He moved back to India in 2004 and after several industrial positions in India in BASF-India, Pfizer-VMPS, Syngene etc., he joined Shiv Nadar University in 2013 as an Associate Professor. He became Full Professor at Shiv Nadar Institution of Eminence in 2019.

Visiting Professorships at Julius Maxmillian University (Wuerzburg, Germany, 2016), at Institut Cochin (Paris, France, 2022), at Middle Tennessee State University (Murfreesboro, USA, 2023) and Applied University of Fribourg (Fribourg, Switzerland, 2024).

Awards
Fellow of Royal Society of Chemistry
Shiv Nadar University Excellence Award
Swiss National Science Foundation Research Fellow

Subhabrata Sen
Department of Chemistry, School of Natural Science, Shiv Nadar Institution of Eminence Deemed to be University, Dadri, Chithera, Gautam Buddha Nagar, UP 201314, India.
Email: subhabrata.sen@snu.edu.in

PL-7

New Therapeutic Leads through Sustainable Medicinal Chemistry

Asit K. Chakraborti*
School of Chemical Sciences, IACS, Jadavpur, Kolkata-700032, INDIA
E-mail: ocakc@iacs.res.in

Abstract

While organic synthesis occupies the central stage of new drug discovery[1] the adverse effect of chemicals on the human being and eco system has led Environment Protection Agency to impose sustainable chemistry practices in the manufacturing process.[2] There has been increasing awareness of green chemistry culture and the necessity to enrich the medicinal chemists' synthetic tool box[3] in pharma industries and academia identifying the key areas for sustainable medicinal chemistry practices.[4] However, the inadequate representation of the newly developed and emerging organic synthetic methodologies in discovery medicinal chemistry remains the major concern[5] since the potential of expansion of the chemical space and scope for IPR generation for new drug discovery are not explored. The integration of sustainable development in organic reactions (e.g., aquatic organic reaction, nano-catalysis, and late-stage functionalization through C-H activation) with the discovery medicinal chemistry[6] is expected to make the desired impact since organic synthesis has the inherent opportunities to transform drug discovery.[7] In view of this, the present talk would present a few case studies on the implementation of a few sustainable medicinal chemistry practices through development of new synthetic methodologies in aqueous medium[8] and through C-H activation[9] synthetic methodologies to generate new anti-TB leads[10] and optimization of anti-inflammatory lead.[11]

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Personal Profile

Professor Asit. K. Chakraborti obtained his Ph.D. in 1985 from IACS, Kolkata under the guidance of Professor U. R. Ghatak. After postdoctoral studies with Professor R. K. Dieter at Clemson University (1985-1987) and Professor Mark Cushman at Purdue University (1987-1989) he served Burdwan University (1990-1994) as Lecturer of Chemistry. He joined NIPER-Mohali in 1994 as a founder faculty as Assistant Professor of Medicinal Chemistry, became Associate Professor in 1999, and Full Professor and Head of Department in 2001. After superannuating from NIPER in 2019 he joined IIT-Ropar as visiting Professor in Chemistry and moved to IACS as Emeritus/Raja Ramanna Fellow in 2021. He has guided 41 PhD and 130 Masters' students, published 180 research papers (with > 13,000 citation, h index 69), and filed 42 patents. Prof. Chakraborti received the University Gold Medal, Bardhaman Sammilani Gold Medal, ISMAS Eminent Mass-spectroscopist award, Ranbaxy Research Award (Pharmaceutical Sciences), Chemical Research Society of India Silver and Bronze Medals, Indian Chemical Society Professor P. K. Bose Memorial Award, Dr. Nitya Anand Endowment Lecture of INSA, and INSA Distinguished Lecture Fellowship. He also received the Rajnibhai V. Patel PharmInnova Best Research Guide Awards for the most "Innovative Ph. D. Thesis" during 2017-2018 and 2016-2017 and the most "Innovative MS Thesis" during 2015-2016 2014-2015 in "Pharmaceutical Chemistry," Certificate of Appreciation for Ph. D. thesis Advisor of Eli Lilly and Company Asia Outstanding Thesis First Prize Awardee in 2013, 2012, and 2009 and Second Prize Awardee in 2009. He is Fellow of the Royal Society of Chemistry and elected Fellow of Indian Academy of Sciences and Indian National Science Academy. His research interest is synthetic organic and medicinal chemistry with thrust in new drug discovery in tuberculosis, leishmaniasis, and inflammation by developing novel synthetic methodologies in compliance with the green chemistry principles and deriving novel concepts.

Prof. Asit K. Chakraborti
School of Chemical Sciences, IACS,
Jadavpur, Kolkata-700032, INDIA
E-mail: ocakc@iacs.res.in

PL-08

Exploring Therapeutic Potential of Phytochemical Entities Through Surface-enhanced Raman Spectroscopy

Kaustabh Kumar Maiti
Senior Principal Scientist, CSTD, Organic Chemistry Section, CSIR-National Institute of Interdisciplinary Science and Technology (NIIST), Industrial Estate P.O., Trivandrum 695019, India
E-mail: kkmaiti@niist.res.in

Abstract

Medicinal plants have demonstrated their potential as a repository of bioactive molecules with promising therapeutic efficacy for identifying novel drug candidates[1,2,3]. In an attempt to investigate new phytochemical entities (NPCEs), naturally occurring Hydnocarpin (Hy) was isolated and purified from *Hydnocarpus wightiana* Blume and evaluated its anticancer potential by synthesizing a series of Hy-containing isoxozole and isoxazoline (Hy-ISO) analogs in lung and melanoma cancer (A549 and A375) cell line. Further detailed apoptotic evaluation along with *in silico* docking studies resulted in two potential Hits (Hy-ISO-VIII & Hy-ISO-G) which prompted us to step forward toward the investigation of surface-enhanced Raman spectroscopy (SERS)[4,5] to study the DNA fragmentation and cyt c release with the synthetic analogs on cancer cells. In this journey, we have explored several other phytochemicals for evaluating their anti-cancer potentiality viz., phaeanthine, a bisbenzylisoquinoline alkaloid isolated from the rhizomes of *Cyclea peltata* (Lam) Hook.f & Thoms., showed selective cytotoxicity towards cervical cancer cells (HeLa) with an IC_{50} of 8.11 ± 0.04 µM[6]. Niloticin, which is a tirucallane-type triterpenoid isolated from the stem barks of *Aphanamixis polystachya* (Wall.) Parker[6]. Malabaricones, a distinct group of secondary metabolites isolated from the fruit rind of *M. malabarica*. We investigated the selective cytotoxicity of Malabaricones against the triple-negative breast cancer (TNBC) cell line[7]. Rhein, a bioactive herbal compound isolated from *Embelia ribes* exhibited anti-inflammatory and anti-cancer properties, to enhance its inhibitory efficacy against CaOx crystallization. Its poor solubility and low bioavailability compromise the clinical viability of rhein. To overcome these challenges, a sonochemical self-assembly technique has been established to transform rhein into nano-rhein, enhancing its inhibitory efficacy. The anti-calcification properties of both rhein and nano-rhein are assessed using Alizarin Red S staining in an *in vitro* model while SERS is unveiled to monitor calcification and growth retardation processes. The newly evolved platform introduces a SERS-based-Alizarin Red S profiling of CaOx inhibition with a fold change of nearly 50 times by the treatment of nano rhein. All this exploration offers insights into the potential of phytomolecules as a promising therapeutic entity for CaOx-induced nephropathies, shedding light on SERS-based diagnostic modality to evaluate the underlying molecular mechanisms.

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Personal Profile

Kaustabh Kumar Maiti studied Chemistry at the University of Calcutta and received M.Sc. in 1993 and Ph.D. in 2001 under the supervision of Prof Avijit Banerji. He started his professional journey in leading pharmaceutical R&D in India (Alembic Ltd and Sun Pharmaceuticals Industries Ltd). Subsequently, he did postdoctoral research at POSTECH, South Korea, Complex Carbohydrate Research Centre (CCRC), University of Georgia, USA, and later engaged as a Research Scientist at Singapore Bioimaging Consortium (SBIC), A*STAR, Singapore. In 2012, he was appointed as a Senior Scientist at CSIR-NIIST, Thiruvananthapuram, India, and subsequently promoted to Sr. Principal Scientist & Professor, AcSIR in April 2020. His current research focuses on cancer diagnostics based on surface-enhanced Raman spectroscopy (SERS) modality, Targeted drug delivery system, and development of new phytochemical entities from natural products. He has published more than 100 scientific publications with an average impact factor of 6.5 and filed 15 patents so far.

Awards:
Service Excellence Award from Singapore Bioimaging Consortium, A*STAR, Singapore, 2011
CSIR Technology Award, CSIR, Ministry of Science and Technology, Govt. of India, 2020

Dr. Kaustabh Kumar Maiti
Senior Principal Scientist, CSTD, Organic Chemistry Section, CSIR-National Institute of Interdisciplinary Science and Technology (NIIST), Industrial Estate P.O., Trivandrum 695019, India
E-mail: kkmaiti@niist.res.in

PL-09

Nanostructured Aggregates Short Peptides for Therapeutic Applications

Amitava Das
Department of Chemical Sciences, Indian Institute of Science Education and Research Kolkata, Pin: 741246, West Bengal, India
e-mail: amitava@iiserkol.ac.in

Abstract

Recent focus has been on designing molecules, materials or molecular composites that can deliver therapeutically active molecules, reactive species or molecular assemblies to the disease site.[1] However, challenges lie in maintaining the desired therapeutic efficacy, site specificity and minimal systemic cytotoxicity towards human physiology. Very recently, attempts have been to address this complex issue using purpose-built stimuli-responsive therapeutics.[2] Advances in utilizing the optoelectronic properties of purpose-built molecular assemblies have contributed significantly to designing various stimuli-responsive drug delivery systems to improve drug efficacies. Some of our recent efforts to demonstrate the proof-of-concept of designing appropriate prodrug or molecular composites for treating cancer or certain bacterial stains will be discussed.[3].

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Personal Profile

Research Interest: Molecular Recognition; Supramolecular Chemistry; Stimuli-responsive nanostructured material, Stimuli-responsive drug release and Imaging Reagents.

Awards and Honors: Prof. P. K. Bhattacharya Gold Medal Lecture Series Award from M.S. University, Vadodara (2020), SERB-J.C. Bose National Fellow-Second Term Since April 2023 from DST-SERB (2017), Fellow of Indian National Science Academy from Indian National Science Academy (2017), CRSI Silver Medal from Chemical Research Society of India (2016), Fellow of Gujarat Science Academy from Gujarat Science Academy (2016)

Amitava Das
Professor
Dept: Chemical Sciences (DCS)
E-mail: amitava@iiserkol.ac.in

PL-10

Ferroelectricity and Piezoelectricity in Supramolecular Donor-Acceptor Materials

Suhrit Ghosh
School of Applied and Interdisciplinary Sciences, Indian Association for the Cultivation of Science,
Kolkata-700032, India
E-mail: psusg2@iacs.res.in

Abstract

Ferroelectric (FE)-materials, exhibiting reversible spontaneous electrical polarization, are of great value for sensors, photonics, energy-efficient memories, and other applications. Organic soft-ferroelectrics are of emerging interest as they promise to offer distinct advantages for robust, lightweight, inexpensive, easily processed, environment-friendly devices.[1] We have recently introduced supramolecular polymers of donor-acceptor charge-transfer complexes, [2] intrinsically polarizable ambipolar chromophoric systems, [3] and chromophore-appended helical polymer [4] exhibiting excellent FE-property at ambient temperatures. By definition, all FE-materials exhibit piezoelectricity, suitable for micropower energy harvesting from mechanical movements. We have recently shown prominent piezoelectricity in chiral supramolecular polymers of ambipolar π-systems with adequate understanding about structural effects.[5] This presentation will highlight our recent work in this area [6] with particular emphasis on the impact of the intrinsic molecular structure, supramolecular assembly with long range order and chirality on ferroelectricity/ piezoelectricity of purely organic donor-acceptor systems.

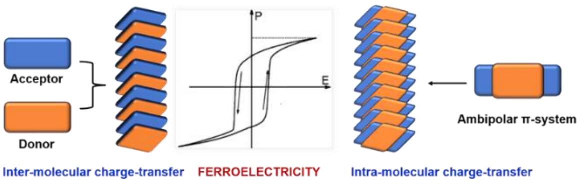

Figure 1. Schematic presentation showing ferroelectricity in supramolecular assemblies of donor-acceptor systems by intra-/ inter-molecular charge-transfer.

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S. Paul, S. Barman, A. Pal, A. Mukherjee, S. Ghosh, A. Datta, *Chem. Mater.* 2023, *35*, 6463.
S. Barman, A. Pal, A. Mukherjee, S. Paul, A. Datta, S. Ghosh, *Chem. Eur. J.* 2023, e202303120.

Personal Profile

Dr. Suhrit Ghosh was born in 1976 in India. After completion of the undergraduate education (Chemistry major) in the Presidency College (now University), Kolkata, he was admitted in the integrated PhD program (Chemical Science) at IISc, Bangalore in 1997. He received the MS degree (Chemistry) in 2000 and continued for PhD till 2005 under the supervision of Professor S. Ramakrishnan. Then he moved to the group of Professor S. Thayumanavan at the University of Massachusetts, Amherst, USA, for postdoctoral studies (2005-2007). Subsequently he worked as a Humboldt postdoctoral fellow (2007-2008) with Professor Frank Würthner at the University of Würzburg, Germany. In 2008 he joined IACS, Kolkata, India, as an Assistant Professor where he currently holds the position of Senior Professor in the School of Applied and Interdisciplinary Sciences (SAIS). He was selected as an Associate of the Indian Academy of Sciences (2009-2012). He is the recipients of the B. M. Birla Science Prize (2014), SwarnaJayanti Fellowship (2015), K. Kishore Memorial Award (2016) from the Society of Polymer Science in India (SPSI), Bronze medal (2017), CNR Rao National Prize for Chemical Sciences (2023) from the CRSI and Santappa Award (2023) from SPSI. He is an elected Fellow of the Indian Academy of Sciences (admitted in 2022). He served as a member of the Editorial Advisory Board of the journal Macromolecules during 2021-2024. Research interest of his group includes supramolecular polymerization of donoracceptor π-systems, H-bonding driven assembly of amphiphilic π-systems/ macromolecules and biologically relevant stimuli responsive aggregation of amphiphilic polymers (polydisulfides, polyurethanes). He has co-authored in > 130 papers in reputed international journals.

Suhrit Ghosh
School of Applied and Interdisciplinary
Sciences, Indian Association for the Cultivation
of Science, Kolkata-700032, India
E-mail: psusg2@iacs.res.in

PL-11

Discovery of first-in-class Pan KRAS degrader clinical candidate for the treatment of mutant KRAS driven cancers

Susanta Samajdar
Aurigene Oncology Limited, 39-40, KIADB Industrial Area,Electronic City Phase II, Bangalore – 560100
E-mail: Susanta_s@Aurigene.com

Abstract

KRAS is one of the most frequently mutated oncogenes in various cancers. KRAS G12D mutation is prevalent in 39% of pancreatic ductal adenocarcinoma (PDAC), 27% of colorectal cancer, 11% of non-small cell lung adenocarcinoma as well as in a subset of other solid tumors. KRAS G12V mutation is found in 31% of PDAC, 20% of colorectal cancer and 19% of non-small cell lung adenocarcinoma. KRASG12C mutations are found in 41% of non-small cell lung adenocarcinoma and 3-5% of colorectal cancers. Despite recent advances in small molecule KRAS inhibitors, a majority of KRAS alterations are not yet addressed. Further, in cases where inhibitors are available, resistance rapidly emerges. Eliminating mutant KRAS using a targeted protein degradation approach may lead to superior efficacy relative to inhibiting the protein.We have identified a degrader through structure-based drug design and our Directed Neo-substrate Degrader (DNsD) approach, with very high co-operativity, potent pan-KRAS activity and a desirable pharmacokinetic profile. The high co-operativity of pan-KRAS degraders was confirmed though Surface Plasmon Resonance (SPR) analysis. These degraders demonstrated significant degradation of KRAS in multiple KRAS mutant cell lines and showed mechanistic activity via the modulation of pERK levels leading to significant ant-proliferative activity. The KRAS degraders were found to be selective against HRAS and NRAS which was also confirmed using global proteomic analysis. Further, the lead compound demonstrated significant and dose dependent tumor growth inhibition in multiple KRAS mutant xenograft models which was accompanied by dose dependent KRAS degradation. Notably, the lead compound has demonstrated good tolerability in rodent and non-rodent tox species. IND enabling studies are ongoing to support clinical development. Complete story starting from lead discovery to candidate identification will be presented.

Personal Profile

Dr. Susanta Samajdar serves as the Chief Scientific Officer at Aurigene Oncology Limited, bringing over 25 years of experience in synthetic and medicinal chemistry research within diverse sectors of Indian industries and academia. He earned his Ph.D. in Synthetic Organic Chemistry from the Indian Association for the Cultivation of Science (IACS) in Kolkata. Subsequently, he pursued Post-Doctoral training in anti-cancer drug discovery at MD Anderson Cancer Centre in Houston, TX.

Dr. Samajdar has spearheaded multi-disciplinary drug discovery teams, resulting in the successful delivery of more than 20 preclinical development candidates spanning the Oncology and Inflammation therapeutic domains. Several of these molecules are in the different phases of clinical development. His proficiency extends across various therapeutic modalities, encompassing small molecules, antibodies, antibody drug conjugates (ADCs), Targeted Protein degradation (TPD), and Natural Products.

He has tackled a range of target classes such as Transcription factors, GPCRs, Ion channels, Proteases, Kinases, NHRs, Epigenetic effector proteins etc. With a prolific track record, Dr. Samajdar has amassed over 100 patents and publications. He has been affiliated with Aurigene since March 2012, contributing his expertise in anti-cancer drug discovery and exploring newer avenues in Oncology research.

Dr. Susanta Samajdar,
KIADB Industrial Area,
Electronic City Phase II, Bangalore
E-mail: Susanta_s@Aurigene.com

PL-12

New Reactivity Patterns by Gold Catalysis

A. Stephen K. Hashmi*

Organisch-Chemisches Institut, Heidelberg University, Im Neuenheimer Feld 270, 69120 Heidelberg, Germany

E-mail: hashmi@hashmi.de

Abstract

In 2000 the two first papers showing a high increase in molecular complexity in gold-catalyzed organic reactions,[1,2] triggered the development of homogeneous gold catalysis to a frequently used tool in different sectors of organic synthesis, e.g. for total synthesis or materials science.[3,4] The crucial influence of reactive intermediates like gold vinylidene intermediates[5,6] or other functionalized gold carbenes[7] on the outcome of gold-catalyzed reactions is well documented. This also involves "gold only"-catalyzed photoreactions,[8,9] which typically go along with a change of oxidation state in the catalytic cycle.We now report interesting new reactivity patterns and demonstrate their impact of the synthesis of organic compounds. This involves gold-only photochemical reactions, new ways to azulene derivatives and the use of functionalized gold carbene intermediates, which as the latest development even allows a chemoselective 1,2-N,O-difunctionalization of unsymmetrical alkynes in one gold-catalyzed reaction. The presentation will address the methodology development, strucrural assignments, scope studies, mechanistic experiments and detailed computational results.

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Personal Profile

Professor A. Stephen K. Hashmi obtained his Ph.D. in 1991 from LMU Munich under the guidance of ProfessorG. Szeimies. After postdoctoral studies with Professor B. M. Trost at Stanford University (1991-1993), he started his independent career with Prof. J. Mulzer at Free University of Berlin, University of Frankfurt and University of Vienna, he obtained his Habilitation from Frankfurt University and was visiting Scientist at the University of Tasmania.After Professorships at Marburg University and Stuttgart University (Associate Professor), he became Full Professor at Heidelberg University in 2007.Visiting Professorships at Gakushuin University (Tokyo, Japan, 2008), at Milan University (Milan, Italy, 2010), Tokyo Institute of Technology (Tokyo, Japan, 2012) and Keio University (Tokyo, Japan, 2015).

Awards:
Dr. Otto Röhm Memorial Fellowship
Karl-Ziegler Memorial Fellowship
ORCHEM Prize for natural sciences of the German Chemical Society
Hector Research Prize 2010

Prof. A. Stephen K. Hashmi,
Heidelberg University, Germany
E-mail: hashmi@hashmi.de

PL-13

Silver, Indium and Rhodium Catalyzed Cyclization Reactions

Subhas Chandra Pan*
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-712412, INDIA
E-mail: span@iitg.ac.in

Abatract

We have also developed the first catalytic enantioselective *de novo* construction of centrally chiral pyrroles through desymmetrization reaction of polycyclic *meso*-cyclohexenediones with activated isocyanides and the products were obtained in high yields with high enantioselectivities.[1] Also a method for the asymmetric allylic dearomatization of novel substrates containing secondary racemic allyl alcohol-tethered α- and β-naphthols. Using iridium/Brønsted acid dual catalysis, the resulting naphthalenone spirocarbocycles were achieved in high yields and enantioselectivities with notable diastereoselectivities.[2] We have recently developed a diastereo- and enantioselective (3+3)-cycloannulation of in situ generated carbonyl ylides and (*E*)-3-benzylidene-3H-indoles enabled by cooperative Rh/chiral phosphoric acid catalysis.[3]

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J. Barman, S. C. Pan, *manuscript submitted*.

Personal Profile

Professor Subhas Chandra Pan obtained his B.Sc. degree in Chemistry Honours in 2001 from Calcutta University and M.S. degree in 2004 from Indian Institute of Science, Bangalore. During his MS thesis he worked in Prof. Goverdhan Mehta's laboratory on the total synthesis of epoxyquinone natural products. He obtained his PhD degree in 2008 under the guidance of Prof. Benjamin List at the Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr, Germany. After doing postdoctoral studies at Harvard University with Prof. E J Corey and at the Scripps Research Institute, Florida with Prof. Glenn C. Micalizio, he joined IIT Guwahati as Assistant Professor in 2011 and was promoted to Associate Professor in 2015 and to Full Professor in 2019.

Awards:
DAE Young Scientist Research Award 2012
Thieme Chemistry Journal Award 2018
Fellow of the Royal Society of Chemistry (FRSC), 2021.
CRSI Bronze medal 2025

Prof. Subhas Chandra Pan
Department of Chemistry, Indian Institute of Technology
Guwahati, Guwahati-712412, INDIA
E-mail: span@iitg.ac.in

PL-14

Synthesis of Spiroindolenines & Carbamates to find an Agro-Chemical Lead

Vanitha Acharya[a,b], ,Venunath Hapse[a], Manish Parab[a], Sujit Ghorai[a], Bhanu M Manjunath[a],
Sitaram Pal*[abc]
[a]*Syngenta Biosciences Private Limited, Santa Monica Works, Corlim, Goa, India 403110*
[b]*Department of Chemistry, Mangalore University, Mangalagangothri, India 576119*
[c]*JSB Agrotech, Kolkata, India*
**E-mail id: sitarampal@hotmail.com*

Abstract

The current research explores the synthesis and biological evaluation of two promising chemical classes - spiroindolenines and carbamates - in the pursuit of novel agrochemical leads. Both classes have shown potential in various biological applications, and our research aims to expand their utility in crop protection and agricultural productivity.

Spiroindolenines in Agrochemical Research: Spiroindolenines, prevalent in indole alkaloids, exhibit diverse biological activities including antimalarial, antimitotic, and insecticidal properties.[1,2] Our research focuses on the synthesis and biological activity evaluation of substituted spiroindolenines and their spiro-[1,2,4]-oxadiazoloindole derivatives. We utilize the imine bond in spiroindolenines for cycloaddition reactions, leading to novel fused spiroindolines with [1,2,4]-oxadiazole moieties. Notably, the synthesized spiroindolenines showed both fungicidal and insecticidal activities, demonstrating their potential as versatile agrochemical leads.

Carbamates as Novel Agrochemical Candidates: Carbamates, ubiquitous in natural products and existing agrochemicals, present an attractive target for agrochemical development.[3,4] Our research explores novel carbamate compounds as potential agrochemical leads. We introduce a new method for carbamate synthesis, aiming to expand the chemical space of potential candidates. Notably, some of the tested carbamates showed good fungicidal activities, highlighting their promise in addressing current challenges in crop protection through innovative carbamate-based compounds.

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Personal Profile

Dr. Pal got his M.Sc. degree from University of Burdwan and Ph.D. from IACS, Jadavpur University in Organic chemistry in the year 1987, 1993 respectively.

He did his postdoctoral research in the department of chemistry, National Tsing Hua University, Twain (2001-2002) and Department of Chemistry, University of Kentucky, USA (2003-2004), both in synthetic organic chemistry.

He works as group leader in CIBA, Mumbai R&D Centre (1997-2001) and as Principal Scientist, Chemgen Pharma International, Kolkata.

He joined Syngenta Biosciences Pvt. Ltd in 2006 as group leader AI research and analytical department.

In Syngenta he was a part of the team which develop several new agro-chemicals!

2024 July Dr. Pal retired from Syngenta as Head Process Research and Analytical chemistry.

His research interests are synthetic method development, natural product synthesis and heterocyclic chemistry and cost-effective sustainable route for new AI.

- He published 30 papers in repute international Journal and 6-patent.
- Wrote one book chapter of 'The Alkaloids".
- Guided five Ph.D. students.

Awards & Honours

1) Syngenta Endowment lecturer 2013, Mangalore University
2) Plenary Lecturer International Conference on Chemistry for Human Development (ICCHD2020) , Kolkata
3) Life member of Indian Association for the Cultivation of Science. IUPAC Affiliate member for the year 1995-96.Life member of Chemical Research Society of India(CRSI)

Dr. Sitaram Pal
Director JSB a small start up organization
and Visiting Prof. KIIT, Bhubaneswar
E-mail:sitarampal@hotmail.com

PL-15

Endo-trig Radical Cyclization in the Synthesis of Terpenoid Natural Products

Tushar Kanti Chakraborty
Department of Organic Chemistry, Indian Institute of Science, Bangalore, INDIA
E-mail: tushar@iisc.ac.in

Abstract

Synthesis of structurally complex and biologically active natural products remains as fascinating and challenging as ever. The practice of the chemical synthesis and its never-ending relevance are getting bolstered by the discoveries of newer and more efficient synthetic methods to meet the growing challenges of diverse structural features and scalability.[1] The methodology developed by us way back in 1997[2] for the synthesis of chiral 1,3-diols by radical-mediated opening of 2,3-epoxy alcohols using $cp_2Ti(III)Cl$ has been successfully employed by our group to construct the 1,3-diol moieties in many biologically active polyketide natural products. Subsequently, we showed that intramolecular trapping of the intermediate radical by a suitably positioned α,β-unsaturated ester moiety in the same molecule can give rise to carbocycles, oxacycles and azacycles.[3] Applications of these reactions in the synthesis of various [5.5.5.6]dioxafenestranes and other terpenoids have been reported by us.[4]

Recently, we reported a systematic study to investigate the less explored *endo-trig* radical cyclization in activated olefin-appended epoxides using $Cp_2Ti(III)Cl$ that gave access to differently 1,3-disubstituted six- and seven-membered carbocycles in good yields and diastereoselectivity. This protocol was successfully employed in the construction of 5,7- and 6,7-fused bicyclic frameworks entailing a de novo synthesis of (±)-isoclavukerin A belonging to tri-*nor*-guaiane class of sesquiterpene natural products.[5a] The methodology encouraged us to undertake the synthesis of Scabrolide A, a member of the furanobutenolide-derived polycyclic cembranoid and norcembranoid natural products. Starting from a suitably functionalized bicyclic lactone synthesized by following our earlier reported Ti(III)-mediated protocol[5b] we constructed the [5-5-6] fused tricyclic core of scabrolide A.[5c] The details will be discussed.

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Personal Profile

Professor Tushar Kanti Chakraborty, FNA, FASc, FNASc, FICS received his Ph.D. in Organic Chemistry from IIT Kanpur in 1984 under the guidance of Professor S. Chandrasekaran. After postdoctoral studies with Professor K. C. Nicolaou at the University of Pennsylvania from 1984 to 1987, he started his independent career at CSIR-IICT, Hyderabad in April 1987 and rose to the Scientist G level. In December 2008, he undertook the Directorship of Central Drug Research Institute, Lucknow and served there till December 2013.

In January 2014, he joined IISc, Bangalore as a Professor in the Department of Organic Chemistry. After superannuation in July 2022, he is presently serving as an Honorary Professor in the same department.

Professor Chakraborty's research interests span diverse areas of organic chemistry from total synthesis of biologically active natural products to peptides and peptidomimetics and designing new molecules for potential therapeutic applications.

Awards and Honours:

Shanti Swarup Bhatnagar Prize in Chemistry in 2002.
Fellow of the Indian National Science Academy (INSA), Indian Academy of Sciences (IAS) and the National Academy of Sciences, India (NASI).
Recipient of INSA Golden Jubilee Commemoration Medal for Chemical Sciences (2022). Chemical Research Society of India (CRSI) Silver Medal (2016) and Bronze Medal (2002).
Pt. Jawaharlal Nehru National Award in Science in 2009.
JC Bose Fellowship in 2008.
NASI-Reliance Platinum Jubilee Award in Physical Sciences in 2006; Andhra Pradesh Scientist Award; Dr. Basudev Banerjee Memorial Award; CSIR Young Scientist Award; AP Akademi of Sciences Young Scientist Award.

Tushar Kanti Chakraborty
Department of Organic Chemistry, Indian Institute of Science, Bangalore, INDIA
E-mail: tushar@iisc.ac.in

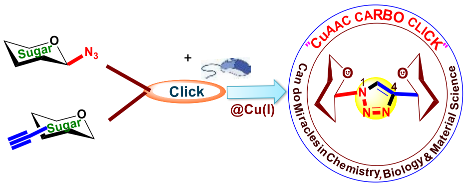
PL-16

Growing Impact of ‘Click Chemistry’ in Glycoscience: Development of Diverse Glycohybrids/Glycodendrimers and their Applications

Vinod K. Tiwari*
Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi, India
Email: Vinod.Tiwari@bhu.ac.in ; Tiwari_chem@yahoo.co.in

Abstract

A clear understanding of the role of carbohydrate in several biological events has led to their increased demand for the complete chemical, biological, and pharmacological investigations. Through utilizing a modular and regioselective ‘CuAAC - Click Chemistry’ tool, tremendous efforts have been made to furnish diverse range of the desired 1,2,3-triazole appended molecular architectures. It just says ‘click’ and the molecules can coupled together through 1,2,3-triazole as biologically imperative linker. In this context, CuAAC mediated synthesis of diverse range of potent glycohybrids and well defined glycodendrimers achieved in my laboratory will be presented in great detail.



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Personal Profile

Vinod Kumar Tiwari earned his MSc from BHU (in 1998), Ph.D. in 2004 from CSIR-CDRI (Mentor: Dr R P Tripathi). Dr. Tiwari had postdoctoral studies at University of Florida (Mentor: Prof. Alan R Katritzky), University of California-Davis (Mentor: Xi Chen), and Guest Scientist at Universitat Konstanz-Germany (Mentor: Prof. Richard R Schmidt). He started his independent career as Assistant Professor at Banaras Hindu University in 2005 and became Full Professor in 2020. His research is focused on synthetic carbohydrate chemistry which is well documented in 185 peer-reviewed publications (*h*-index: 47, i_{10} index: 132, Citation: 9210) in addition to 8 Patents, 6 books, and 25 book chapters. He supervised 17 PhDs, completed 11 major grants and delivered 286 invited lectures in India and abroad. Dr. Tiwari holds editorial board/Guest editor of *Carbohydrate Research*, *J. Carbohydrate Chem.*, *Current Organic Chemistry*, *Synthesis*, *Synlett*, *Scientific Reports*, etc.

Honors / Award received (Selected list):

1. Listed in the Top 2 % Scientist Ranking for the Year 2020, 2021, 2022, 2023, and 2024
2. Prof. S P Hiremath Award-2024, Indian Council of Chemists,
3. C G Merchant Memorial Award-2022 for contribution to ‘Click Chemistry in Glycoscience’
4. Chemical Research Society of India (CRSI) Bronze Medal for the year 2021
5. Most Productive Researcher Award-2019, Banaras Hindu University
6. Excellence in Carbohydrate Research Award-2019, ACCT(I)
7. Dr. S. S. Deshpande National Award-2016 for High Impact Contribution in Chemistry.
8. 1st Prof N Roy Award for Excellence in Carbohydrate Chemistry-2015
9. Prof. A. S. R. Anjaneyulu 60th Birthday Commemoration Award-2014
10. Dr. Ghanashyam Srivastava Medal-2012, Indian Chemical Society
11. 1st Dr. H C Srivastava Award-2012, ACCT(I)
12. Prof. R C Shah Memorial Lecture Award-2011 (ISCA)
13. Dr. Arvind Kumar Memorial Award-2010, Indian Council of Chemist
14. Young Scientist Award (UP-CST-2010, ICS-2004, ICRABTS-2004, and CRSI-2012)
15. CRSI Council Member (2023-2026); Hony. Secretary, ACCTI (2023-26

Vinod K. Tiwari
Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi, India
Email: Vinod.Tiwari@bhu.ac.in ;
Tiwari_chem@yahoo.co.in

PL-17

Materials Growth and Unique Alloy Properties of Group III-Nitride Semiconductors

Pushan Guha Roy, Sayantani Sen and **Anirban Bhattacharyya***
Institute of Radio Physics and Electronics, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: anirban.rpe@caluniv.ac.in

Abstract

The Group-III/Nitride semiconductors, consisting of GaN, AlN, InN and their ternary and quaternary alloys have been studied for several decades, and visible light emitting diodes based on InGaN alloys now dominate the world of solid-state illumination. The alloy properties of InGaN are well established, and phase segregation due to spinodal decomposition driven by the size difference of In and Ga atoms leads to the formation of spontaneous compositional fluctuations in this material. This property has been critical in the development of efficient blue light emitting diodes with high radiative recombination probability, even for films with very large density of threading dislocations. On the other hand, AlGaN alloys does not exhibit this behavior, and ultraviolet light emitting diodes (UV-LEDs) based on these alloys are limited in their efficiency, even after several decades of research. These alloys however exhibit long range chemical ordering of various periodicities[1a,], as has been established by us and other groups over the years.Recently we found that the during growth of AlGaN alloys with very high AlN mole fraction by the Plasma-Assisted Molecular Beam Epitaxy, certain deposition conditions lead to an observation of phase segregation-like behavior[1b]. Specifically, control over the group-III to group V ratio allows the deposition of films that show a characteristic splitting of the (0002) peak in the HIRXRD pattern. Furthermore, for optimized growth conditions, compositional inhomogeneity can be deliberately introduced in the alloy, which consequentially show a high efficiency in radiative recombination[1c], and increased brightness of UV-LEDs. Finally, we present a recently-developed wavelength switchable UV-LED device[1d].

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Personal Profile

Anirban Bhattacharyya received his Ph D in Electrical Engineering with specialization in Electro-optics from Boston University, USA in 2005, and continued there as a senior research associate till 2009. Thereafter, he returned to India as an Assistant Professor at the Institute of Radio Physics and Electronics University of Calcutta, and has been associated with the development of extensive nanofabrication facilities at the Centre for Research in Nanoscience and Nanotechnology. His major research contribution has been in the development of III-Nitride semiconductor materials and quantum structures based on them. In the field of optoelectronic devices, he has developed standard and wavelength-switchable ultraviolet LEDs, electron-beam pumped UV sources, optical modulators, and wavelength selective UV photodetectors. He has also worked on development of THz emitters based on intersubband transitions, all-optical switching, and quantum-dot based devices. Anirban Bhattacharyya has about 90 research publications and one US patent. Five students have received their doctoral thesis under his supervision. He received the Materials Research Society of India medal in 2016.

Anirban Bhattacharyya
Institute of Radio Physics and Electronics, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: anirban.rpe@caluniv.ac.in

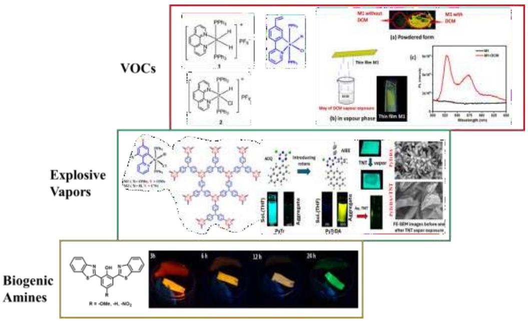
PL-18

Molecular Luminescent Compounds for Efficient Analyte Sensing in Vapor/ or Gas Phase

Inamur Rahaman Laskar
Department of Chemistry, BITS Pilani, Pilani Campus, Rajasthan 333 031
E-mail: irlaskar@pilani.bits-pilani.ac.in

Abstract

In recent years, harmful environmental substances such as volatile organic compounds (VOCs), nitro explosives, acid vapours and biogenic amines have raised significant concerns due to their adverse effects on human health and ecological systems.[1] The detection of these hazardous substances necessitates the development of highly sensitive and selective luminescent materials. This study presents the systematic development of various detection systems, including iridium(III)-based luminescent complexes, porous organic polymers, and small organic molecules, for the selective sensing of key hazardous compounds such as methylene chloride (DCM), 1,4-dioxane, picric acid (PA), 2,4,6-trinitrotoluene (TNT), acid vapors, and biogenic amines in their vapor phases. DCM, a widely used industrial solvent, was detected using two iridium(III)-based 'Aggregation-Induced Emission' (AIE) active probes.[2] These probes exhibited high sensitivity and reversibility upon removal of DCM vapors. The detection of PA and TNT vapors requires materials with a high surface area for capturing efficiently. Porous organic polymers, iridium(III)-complexincorporated polymers, and small organic molecules with vertically grown morphologies were synthesized to address this need.[3], [4] Rapid monitoring of volatile acid vapors which is discharged during global industrialization is crucial to ensure environmental safety. The molecular luminescent materials developed in this study showed promising results in detecting these hazardous vapors. Biogenic amines released during poultry meat spoilage which have been detected using ESIPT active probe molecules. Molecular oxygen, vital in industrial and biological processes, was detected using systematically developed monocyclometalated iridium(III) complexes with significantly improved detection limits.



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Personal Profile

Currently, **Dr. I. R. Laskar** is working as Professor at Department of Chemistry (also HoD of the Department), Birla Institute of Technology & Science, Pilani. He completed Ph. D. degree in Inorganic chemistry from Indian Association for the Cultivation of Science (IACS), Kolkata in 2000. He was lecturer at Ananda Mohan College during Sept., 1999 to July, 2001. Then he completed postdoctoral fellowship at National Chiao Tung University, Taiwan for 4.5 years and JSPS Postdoctoral fellowship for 2 years at Kochi University, Japan. He joined BITS Pilani in Aug, 2008. His research interest lying on the development of molecular based luminescent compounds, sensing of various analytes, mechanofluorochromism, thermally activated delayed fluorescence, Photodynamic Therapy. He has published over 70 papersin internationally reputed journals and filed three patents. He has accomplished six projects from multiple funding agencies. The DRDO funded project has been recognized and felicitated by the Defense minister, Govt. of India in 2023.

Dr. Inamur Rahaman Laskar
Department of Chemistry, BITS Pilani, Pilani Campus, Rajasthan 333 031
E-mail: irlaskar@pilani.bits-pilani.ac.in

PL-19

Utilization of CO_2 in synergistic triple catalysis for anti-Markovnikov hydrocarboxylation of industrial alkenes

Debabrata Maiti
Indian Institute of Technology Bombay, Mumbai, India
Email: dmaiti@iitb.ac.in

Abstract

The direct use of CO_2 as a C1 synthon for the construction of new carbon-carbon bonds remains a critical challenge in chemical synthesis.[1-3] Carbon dioxide, as a linear molecule with no dipole moment, exhibits high kinetic and thermodynamic stability under most reaction conditions. As a consequence, the activation of CO_2 to form carboxylic acid derivatives traditionally requires highly reactive nucleophiles and/or harsh reaction conditions (Fig. 1a).[4-6] In contrast, the single electron activation mode of CO_2 proceeds via the generation of an unstable reactive species, carbon dioxide radical anion ($CO_2^{\bullet-}$), which could potentially be exploited to harness carboxyl functionalities into a plethora of molecules in both academic and industrial setting (Fig. 1a).[7,8]

The direct utilization of carbon dioxide as an ideal one-carbon source in value added chemical synthesis has garnered significant attention from the standpoint of global sustainability. In this regard, the photo/electro-chemical reduction of CO_2 into useful fuels and chemical feedstocks could offer a great promise for the transition to a carbon-neutral economy. However, challenges in product selectivity continue to limit the practical application of these systems. A robust and general method for the conversion of CO_2 to the polarity-reversed carbon dioxide radical anion, a C1 synthon, is critical for the successful valorization of CO_2 to the selective carboxylation reactions. We demonstrate herein a hydride and hydrogen atom transfer synergy driven general catalytic platform involving $CO_2^{\bullet-}$ for highly selective anti-Markovnikov hydrocarboxylation of alkenes via triple photoredox, hydride, and hydrogen atom transfer catalysis. Mechanistic studies suggest that the synergistic operation of triple catalytic cycle ensures a low-steady state concentration of $CO_2^{\bullet-}$ in the reaction medium. This method using renewable light energy source is mild, robust, selective and capable of accommodating a wide range of activated, and unactivated alkenes. The highly selective nature of the transformation has been revealed through the synthesis of hydrocarboxylic acids from the substrates bearing hydrogen atom available for intramolecular 1,n-HAT process as well as diastereoselective synthesis. This technology represents a general strategy for the merger of in situ formate generation with synergistic photoredox and HAA catalytic cycle to provide $CO_2^{\bullet-}$ for selective chemical transformations.

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Personal Profile

Prof. Maiti has an expertise in the broad spectrum of organic chemistry. He is one of the pioneers of distal C-H functionalization of organic molecules via the directing group approach. The C-H functionalization of aliphatic C-H bond is a major challenge in chemistry, his design of the suitable catalyst and the reaction conditions can now lead to products with high efficiency and more importantly with excellent selectivity. His recent contribution to the distinct single metal catalyzed cross-electrophile coupling has the potential to bring a new disconnection to the cross-coupling domain. He is currently focusing the utilization of green-house gases such as CO_2, CO in organic chemistry to synthesize important organic products using mild reaction conditions at room temperature.

Awards

Shanti Swarup Bhatnagar Prize (SSB) for Science and Technology 2022

FASc, Fellow of Academy of Sciences

Humboldt Research Fellowship
FRSC, Fellow of the Royal Society of Chemistry

Prof. Debabrata Maiti
Indian Institute of Technology Bombay, Mumbai, India
Email: dmaiti@iitb.ac.in

PL-20

PAC Award Lecture:

Synergy for Sustainability:
The power of Collaboration and Partnership in Driving Innovation

Sunil Kumar Mandal
R&D Unit: Plot No. DS-10, IKP Knowledge Park, Genome Valley, Survey No. 542/2, Turkapally Village, Shamirpet Mandal, Medchal- Malkajgiri District, Hyderbad- 500101, India
E-mail: sunilkumar.mandal@pihealthsciences.com

Abstract

Collaboration and partnership are essential for successful innovation, especially when adapting to new technologies and environmental challenges. This presentation will explain how strategic partnerships and teamwork among various stakeholders—such as suppliers, manufacturers, consumers, and policymakers—can lead to transformational changes. By combining their expertise and resources, organizations can create innovative solutions that improve efficiency and support sustainable development.

A major focus for companies is incorporating Environmental, Social, and Governance (ESG) principles into their collaborative efforts. This approach tackles important issues like reducing carbon footprints, promoting social equity, and ensuring transparent governance. By setting examples and inspiring future leaders to adopt a collaborative mindset, we can see that working together is key to achieving long-term sustainability and driving impactful innovation.

Personal Profile

Dr. Sunil Kumar Mandal earned his PhD in 1999 from the National Chemical Laboratory, Pune, under the mentorship of Dr. Amitabha Sarkar. He further honed his expertise through postdoctoral studies with renowned scientists: Prof. William Crowe at Louisiana State University, Baton Rouge, USA; Prof. Mathew Sigman at the University of Utah, Salt Lake City, USA; and Prof. K. C. Nicolaou at the Scripps Research Institute, La Jolla, USA. Additionally, he completed an executive management course at Harvard Business School.

Dr. Mandal’s industrial career began in drug discovery research at Acenta Discovery Inc., Arizona, followed by a brief tenure at Jubilant Chemsys Ltd., Noida, India. He then dedicated a decade to the Biocon-BMS Research Center (BBRC) in Bangalore, contributing to the drug discovery research across various therapeutic areas. His career also includes over five years in crop protection research at PI Industries Ltd., Udaipur, India.

Currently, Dr. Mandal heads the Hyderabad site of PI Health Sciences Ltd., specializing in CRO and CDMO services. With nearly 25 years of diverse R&D experience in pharmaceuticals and agrochemicals, he is a distinguished scientist and industrial leader. He holds several patents and has authored numerous publications in international journals. Dr. Mandal is an IICA-certified Independent Director and a CPD-accredited ESG expert. A passionate advocate for sustainable research, he actively mentors and develops the next generation of scientists and leaders.

Dr. Sunil Kumar Mandal,
Vice President and Site Head,
PI Health Sciences Ltd., Hyderabad, India

PAC Award Lecture:

Technologies for Continuous Manufacturing: Reaction, Inline work-up and beyond

Dr. Sandeep Jain
Sr. Director, PI Industries Ltd. Post Box No.20, Udaisagar Road, Udaipur 313001, Rajasthan, India, www.piindustries.com

e-mail: *sandeep.jain@piind.com*

Abstract

Converting traditional batch processes to continuous flow offers enhanced efficiency, productivity, and quality. This abstract outline a comprehensive framework for integrating continuous flow technologies across the entire process life cycle, encompassing reaction, separation, displacement, crystallization, and drying operations.
Key strategies include:

1. Process mapping and optimization for continuous flow
2. Selection of suitable flow technologies for each unit operation
3. Integration and synchronization of unit operations for seamless transitions
4. Implementation of in-line process analysis tools for real-time monitoring
5. Scalability, equipment design, process control, and regulatory compliance considerations

A successful commercial-scale continuous flow process requires careful planning, design, and execution. Examples from chemical and pharmaceutical industries, PI continuous manufacturing facilities, demonstrate the feasibility and benefits of this approach. By adopting a holistic continuous flow strategy, industries can achieve significant improvements in efficiency, quality, and cost competitiveness.

Personal Profile

Dr. Sandeep jain with 26 years of experience in R&D-driven pharmaceutical and chemical industries, Dr. Sandeep Jain is a seasoned expert in process development and flow chemistry. He holds a PhD from Jiwaji University, Gwalior. Dr. Jain's illustrious career spans top Indian pharmaceutical companies, including:

- Indswift Laboratories
- Torrent Research Centre
- Jubilant Life Sciences
- Aurobindo Pharma
- Sun Pharma

His extensive experience and expertise have earned him a reputation as a leader in the field of process development and flow chemistry. He successfully developed and scaled more than 25 project in flow.

Dr. Sandeep Jain
PI Health Sciences Ltd., Hyderabad, India
e-mail: sandeep.jain@piind.com

PL-21

Cerium Ammonium Nitrate (CAN)/ROH And Iodine/CAN As Efficient Reagents For C-H Functionalization: Synthetic Transformation Of MBH Adducts Of *N*-Methyl Isatin, 3,3’-Bis-Indolyl And 3,3’-Bis-7-Azaindolylmethane

P. Shanmugam
Organic and Bioorganic Chemistry Division, CSIR-Central Leather Research Institute (CLRI), Adyar, Chennai-600020, India; Email: shanmu196@rediffmail.com & shanmu196@clri.res.in

Abstract

Oxidation of unactivated sp^3 N-C–H and C-H bonds into oxygenated products requires an efficient reagent system or catalyst, which could be highly reactive and predictably selective.[1] Cerium(IV) ammonium nitrate (CAN) has emerged as a versatile reagent for various synthetic transformations.[2] Way back, we have demonstrated activation of the NC–H bond of Morita-Baylis–Hillman (MBH)[3] adducts of N-methyl isatin with CAN/ROH and C-H oxidation of 5-methyl-N-alkylisatin to 5-formyl-N-alkylisatin.[4] 7-Azaindole and its derivatives have a wide range of applications in both pharmacological and material properties.[5] In continuation of our work and to demonstrate CAN with additives as an efficient one-electron chemical oxidant, and considering the biological importance of 7-azaindole, the combination of I_2/CAN for oxidative cleavage of Csp^3-Csp^2 for 3,3’-bis-7-azaindolylmethane, where we reported the reactivity on secondary methylene -C-H bond, furthermore, I_2/CAN has emerged as a powerful and efficient oxidizing agent for direct tertiary C-H oxidation of 3,3'-(phenyl methylene) bis(*N*-methyl-7-azaindole) under mild conditions to form bis(*N*-methyl-7-azaindol-3-yl) (phenyl)methanol in quantitative yield. Reaction mechanisms, scope, and synthetic utility of the products thus obtained will be presented (Scheme 1).[6]

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Personal Profile: **Dr. P. Shanmugam** obtained his Ph.D. in Synthetic Organic Chemistry in 1996 from the University of Madras. After post-doctoral research on the total synthesis of plakortones with Prof. Martin F. Semmelhack, Princeton University, USA, and second post-doctoral work on organoaluminium reagents in association with Prof. Maasaki Miyashita, Hokkaido University, Japan. He started his career as a scientist at the CSIR-NIIST, Trivandrum, and CSIR-CLRI, Chennai, and he has been an active researcher in Synthetic Organic Chemistry. By distinction, his work has been recognized both nationally and internationally, as evidenced by his peer-reviewed and acclaimed publications in more than 105 high-impact synthetic organic chemistry journals with 1800 citations.He received several awards, including the prestigious JSPS fellowship awarded by the Japanese government and the BOYSCAST fellowship awarded by DST, New Delhi. Dr. P. Shanmugam has supervised 17 Ph. D. students and many M. Phil and 90 M. Sc projects. Currently, three students are pursuing research under his guidance. He is an eminent speaker at major national and international conferences
.

Dr. P. Shanmugam
Organic and Bioorganic Chemistry Division, CSIR-Central Leather Research Institute (CLRI), Adyar,
Chennai-600020, India;
Email: shanmu196@rediffmail.com

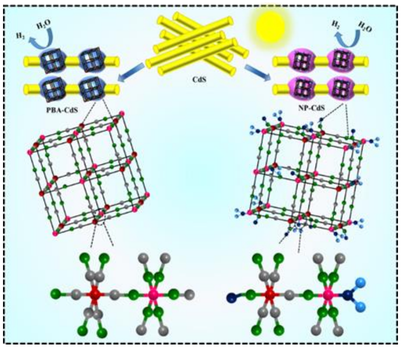
PL-22

Building a bridge between organometallic chemistry and energy conversion processes

Arindam Indra
Department of Chemistry, IIT (BHU), Varanasi, UP-221005, INDIA
E-mail: arindam.chy@iitbhu.ac.in

Abstract

The photocatalytic energy conversion processes like H_2 evolution and CO_2 reduction reactions require an efficient photocatalyst to absorb light in the visible region.[1] In this talk, the use of CdS nanorods as the photocatalyst for the different energy conversion processes will be described. Although the bandgap and band positions of CdS suit the photocatalytic H_2 evolution and CO_2 reduction, the high charger combination rate than the surface redox reaction(s) make the process challenging.[2] In this context, the cocatalyst plays an important role in charge separation and transport and the minimization of charge recombination.[1] Herein, we will explore the designing of efficient cocatalysts based on the principles of organometallic chemistry. The cocatalytic activities of different coordination polymers, viz., CoFe–Prussian blue analog (CoFe–PBA) and CoFe–nitroprusside (CoFe–NP) integrated on the surface of CdS nanorods will be demonstrated for the photocatalytic hydrogen evolution reaction (Figure 1).[3] The π-acidity of –CN vs –NO will be explored in the cocatalyst structure for a better separation and transport of the photogenerated charge carriers and hence an improved photocatalytic activity.[4-5] In addition, the effect of the spin state of cobalt ion in CoCo-PBA will be described in controlling the activity of CO_2 reduction and the selectivity of the product formation for a CoCo-PBA@CdS photocatalyst.[6]



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Personal Profile

Dr. Arindam Indra is an Assistant Professor in the Department of Chemistry, IIT (BHU), Varanasi (India). He completed his Ph.D. from IIT Bombay (Mumbai, India) on solid-supported nanocatalysts for industrially important organic reactions. After Ph.D, he joined Technische Universität Berlin (Germany) as a postdoctoral fellow and developed transition metal-based catalysts for oxygen redox reactions. He received the Brain Korea Award and joined Hanyang University (Seoul, Republic of Korea) as an Assistant Research Professor. He developed self-supported catalyst systems for electrochemical water splitting. Currently, his group works in the area of metal-organic framework-derived catalysts focusing on electrochemical and photocatalytic energy conversion processes. He was recognized as the “Top 2% scientists Worldwide-2020-2024” in Chemical Physics category by Stanford University.

Dr. Arindam Indra
Department of Chemistry, IIT (BHU), Varanasi, UP-221005, INDIA
E-mail: arindam.chy@iitbhu.ac.in

PL-23

Melatonin protects against non-steroidal anti-inflammatory drug-induced gastric ulceration: Mechanism(s) and significance

Debasish Bandyopadhyay

Department of Physiology, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA.

E-mail: debasish63@gmail.com; dbphys@caluniv.ac.in

Abstract

Pain is a prevalent and significant health concern, affecting a substantial portion of the population, particularly office workers, who experience pain at alarmingly high rates. Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used for pain management due to their effectiveness in reducing inflammation and pain. However, NSAIDs' non-selective inhibition of COX-1 and COX-2 enzymes leads to undesirable side effects, like gastrointestinal ulcers. Recent findings have highlighted the role of melatonin, a pineal indolamine, in mitigating NSAID-induced gastrointestinal damage due to its antioxidative properties. Melatonin has shown superior gastroprotective effects compared to other antioxidants, offering a promising adjunct therapy to enhance the safety of NSAID use. In addition to being produced by the pineal gland, melatonin is also found in various plant sources like cherries, grapes and tomatoes. This highlights the potential for natural compounds to mitigate the side effects of synthetic drugs. The enzymatic pathways involved in melatonin's protective mechanisms offer a fascinating area of study for developing safer therapeutic strategies. Thus, there is a need for highlighting the cautious use of NSAIDs and understanding the potential benefits of integrating melatonin into pain management protocols to reduce adverse effects and improve patient outcomes.

Keywords

NSAID, Gastric ulcers, Melatonin, Enzymatic catalysis.

Personal Profile

Dr. Debasish Bandyopadhyay is presently Professor at the Department of Physiology, University of Calcutta. He served this department as the Head for two full tenures. Before joining the University of Calcutta, he was the founder Head of the Department of Biotechnology, Assam (Central) University, Silchar, Assam, India, followed by Head, Centre for Biotechnology, Visva-Bharati University (a Central University), Santiniketan, Bolpur, India. He did his Ph. D. work at CSIR-Indian Institute of Chemical Biology, Calcutta and his post- doctoral work at University of Texas Medical Branch (UTMB) at Galveston, Texas, USA. Prof. Bandyopadhyay has been working on melatonin since last few decades and has made significant research contributions on melatonin in the domains of enzymology, oxidative stress and free radical biology, myocardial ischaemia, gastric ulceration which have been recognized world over. Moreover, he has also made an impact in the field of development of new drug/ antioxidants of synthetic or natural origin. He has National and International collaborations and has published more than 125 research papers till date in national and international peer-reviewed journals. Prof. Bandyopadhyay is a regular reviewer of numerous leading journals published by Elsevier and other internationally renowned publishers. He is one of the editors of the journal named 'Melatonin Research' published from USA. Moreover, Prof. Bandyopadhyay is a recipient of prestigious ‘Parimal Bikash Sen Memorial Oration Award’ from Physiological Society of India, Calcutta. Very recently Prof. Bandyopadhyay has also received ‘Prof. S. C. Mahalanobis Memorial Oration Award’ from Physiological Society of India; the highest award conferred by them. Besides, he is one of the founder fellows of the Physiological Society of India, Kolkata.

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Prof. Debasish Bandyopadhyay
Department of Physiology, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA.

PL-24

Photosynthetic and Electrosynthetic Approaches towards Sustainable Synthesis of Drug-like Cores

Prof. Asish R. Das*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: ardchem@caluniv.ac.in ; ardas66@rediffmail.com

Abstract

Development of innovative synthetic methodologies involving the use of chemicals that reduce the hazards to humans and the environment have received increasing interest in recent decades. [1] As a result, this has encouraged the synthetic organic chemists and pharmaceutical industry to aim the sustainable development of bio-responsive pharmacophores following the principles of 'Green Chemistry'. [2] In this context, a number synthetic organic chemistry groups have developed various eco-friendly protocols under thermal (both conventional and microwave) and mechanochemical conditions. [3] Although these procedures offer greater extent of sustainability, but sometimes they demand harsh chemical treatments (like sacrificial oxidants, extremely acidic conditions, commercially available or modified metal catalysts, excess thermal energy etc.) and sophisticate instrumentation (microwave heater and ball-milling apparatus). To minimize these disadvantages, the photochemical and electrochemical synthetic strategies have emerged as the environmentally benign methodology in recent years. [4] These procedures entail lower amount of energy to promote the reactions compared to the thermal conditions. Majority of the photo- and electro-chemical protocols are either free of catalysts or deal with extremely lower concentration of catalysts. [5] Again, the electrochemical reactions involve the single-electron activation of organic substrates on the application of electrochemical anodic oxidation with some incredible features like use of electron as the reagent and electrical current to promote one or more redox events in one pot under an extremely mild reaction condition with enhanced atom economy and good functional group tolerance. [6]For the demonstration of sustainable practices in the synthetic organic chemistry, our group have developed visible light induced and electrochemical approaches towards the synthesis of small drug-like cores.Initially, we have developed a photocatalyst-free regioselective decarbonylative and decarboxylative C-O functionalization protocols to grab aryl 2-aminobenzoates and 2-substituted benzoxazinone derivatives with marked yields, following chemoselective scission of isatoic anhydride with ketones, diaryliodonium triflate, nitro alkene, phthalazinone and phenol derivatives as the representative "electophilic and nucleophilic" coupling conjugates respectively.[7]Following this, we have now developed a visible light induced (4+2) cycloaddition reactions among the aromatic or aliphatic diamines and various α-diazo carbonyl compounds to realize quinoxaline and quinoxalinone scaffolds.The electrochemical method illustrates the synthesis of functionalized diazepines and quinazolines that circumvents the limitations associated with traditional methods through reorganization of the molecular skeleton via a domino N^1–N^2 bond cleavage followed by concomitant ring closing process indulged by electrical energy initiating from cinnolines and indazoles as designed precursors. Additionally, an intermolecular ring homologation method has also been devised to synthesize densely functionalized dihydroquinazolines from 2,3-diaryl-indazoles and acetonitrile involving the same electrochemical strategy.[8]

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[8] S. Islam, D. Das*, R. D. Mandal, S. Dhara, A. R. Das*, J. Org. Chem. 2024, 89, 15686–15693.

Personal Profile

Prof. Asish R. Das was born in Kolkata in 1966 (India), graduated in chemistry from University of Calcutta and received his PhD degree from Jadavpur University(Kolkata) pursuing research at the Indian Association for the Cultivation of Science, Kolkata, India under the supervision of Prof. Brindaban C. Ranu. He did postdoctoral research with Professor Reuben Jih-Ru Hwu at NTHU, Taiwan. He joined Department of Chemistry, University of Calcutta in 1996 as Lecturer. Since 2011, he has been the Professor at the Department of Chemistry, University of Calcutta and has been pursuing research on the development of new synthetic methods which includes nano metal oxide and nano particle mediated catalysis, use of green tools (Visible-light, Electrosynthetic approach etc.) and green synthetic procedures, metal ion as the promoter in carbon-carbon and carbon-hetero atom bond formation and synthesis of novel heterocyclic molecules of medicinal interest through C-H bond activation. He has published nearly hundred papers in scientific journals, eight book chapters and he has been awarded five international patents**.**

Prof. Asish R. Das*
Department of Chemistry, University of Calcutta,
92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: ardchem@caluniv.ac.in ;
ardas66@rediffmail.com

PL-25

Development of various transition metals, nitrogen and sulfur doped carbon for application as cathode catalyst in single chamber microbial fuel cell

Simran Kaur Dhillon, **Patit Paban Kundu***
Department of Chemical Engineering,Indian Institute of Technology Roorkee
E mail: patit.kundu@ch.iitr.ac.in

Abstract

The performance of the fabricated air-cathodes based on iron and nitrogen doped carbon (Fe/NC) and polyaniline coated Fe/NC (PANI@Fe/NC) was systematically evaluated in single chamber MFCs with activated sludge as inoculum[a]. The electrochemical analysis highlighted the superior performance of PANI@Fe/NC with a peak reduction current of -0.214 mA, charge transfer resistance (R_{ct}) of 132.5 Ω, and improved ORR activity. PANI@Fe/NC achieved the highest power output (637.53 mWm^{-2}) and was 36.25% higher than conventional 10 wt% Pt/C (467.92 mWm^{-2}). When Magnesium Cobaltite Embedded in Ccorncob- derived Nitrogen-doped Carbon is used as Cathode Catalyst for Power Generation in Microbial Fuel Cell, the power output of MFC with $MgCo_2O_4$/NC-700 as air-cathode reaching to 873.81 mWm^{-2} is 59.56% and 216.05% higher than that of MFC with Pt/C (547.65 mWm^{-2}) and Co/NC-700 (276.48 mWm^{-2}) cathode, respectively [b]. In case of carbon developed from pyrolysis of Transitional Trimetallic Alloy (Fe, Co and Ni) Embedded in Poly- acrylamide Hydrogel used as cathode catalyst in SCMFC, trimetallic composite (FeCoNi@NC) performed better than Pt/C, exhibiting superior electrocatalytic activity with high oxygen reduction peak potential of 0.394 V (vs. RHE) and a corresponding peak current density of -0.159 mA. FeCoNi@NC records a high power density of 963.5 mWm^{-2}, current density of 2483.2 $mA\ m^{-2}$, 3.287 and 1.136 times higher than NC and 10 wt% Pt/C, respectively [c]. When synthesized carbon is decorated with $NiCo_2S_4/NiCo_2O_4$ and derived from the pyrolysis of Poly (aniline-2-sulfonic acid) modified Polyacrylamide and used as Cathode Catalyst for Power Generation in Single Chamber Microbial Fuel Cells, SPAN-PAN/Ni-SNC exhibits the highest power density of 2045.1 mWm^{-2} at 8343.8 mAm^{-2} compared to 873.67 mWm^{-2} and 5453.6 mAm^{-2} for Ni-SNC, indicative of the significant improvement in the catalytic ability of the cathode catalyst formed by the interweaving of Ni-SNC and conducting co-polymer[d]. This could be attributed to the coordination of sulfur, nickel, and nitrogen in the polymeric chain.

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Personal Profile

Professor P. P. Kundu obtained his Ph.D. in 1997 from IIT Kharagpur under the guidance of Professor D. K. Tripathy. Just after completion of his Ph.D. work in 1996, he joined SLIET, Longowal (a deemed university of GOI, India) as Lecturer and promoted to Professor in 2007. In 2008, he joined as professor of Polymer sc & Technology, University of Calcutta. Since May 2016, he is working as Professor of Chemical Engineering, Indian Institute of Technology Roorkee and in January 2024, he is promoted to the HAG rank professor. Till date, he has delivered invited talk in various countries such as South Korea, Greece and Italy. As per Stanford University report, he is identified as 2 % topmost scientist of the world in the area of Polymer Science. His current H-index is 56 and cited more than 10000 times. Currently, he is working as non-executive director of KG Ecoplast Private Limited.

Patit Paban Kundu
Professor (HAG), Indian Institute of
Technology Roorkee, India

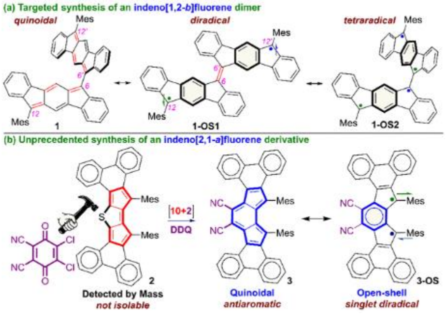
PL-26

π-Extended Antiaromatic Indenofluorenes: From Targeted to Unusual Syntheses and Open-shell Properties

Soumyajit Das*
Department of Chemistry, Indian Institute of Technology Ropar, Rupnagar 140001, Punjab, India
E-mail: chmsdas@iitrpr.ac.in

Abstract

Exploration of polycyclic hydrocarbons (PHs) with antiaromatic and diradical properties has attracted immense interest in recent years, as tuning such properties may provide paths toward small bandgap organic semiconductors with promising applications in molecular spin/electronics.[1a] Indeno[1,2-*b*]fluorene and indeno[2,1-*a*]fluorene are stable isomers of formally antiaromatic 20πe-indenofluorene (IF) series.[1b] We developed a steric-promoted synthetic approach for π-extended antiaromatic [1,2-*b*]IFs,[1b] and lately used this steric approach to construct the first open-shell (OS) IF dimer 6,6'-biindeno[1,2-*b*]fluorene **1** that exhibits 26.8% diradical (**1-OS1**) and 0.7% tetraradical (**1-OS2**) character in the singlet ground state.[1c] 6,6'-[1,2-*b*]BIF **1** exhibits superior properties when compared to those of its 3,3'-[1,2-*b*]BIF[1d] and aromatic bipentacene (BP) counterparts, such as smaller HOMO-LUMO (1.50 eV) and singlet-triplet (−4.85 kcal/mol) energy gaps, and a low LUMO of −3.80 eV which is stabilized by 0.82 eV than that of the BP counterpart. I shall also present our attempt to synthesize a π-extended heterocyclic IF **2**, an elusive synthetic target to date. While we detected it by mass spectrometry, it underwent an unusual [10+2] cycloaddition with residual DDQ to afford a tetrabenzoindeno[2,1-*a*]fluorene **3** by the loss of a sulfur atom and ClC(═C═O)C(Cl)═C═O unit from the **2-DDQ** adduct on neutral silica gel. The cyano disubstitution at *as*-indacene subunit (shown in blue) of [2,1-*a*]IF **3** stabilized the LUMO (−4.15 eV) significantly, resulting in a narrow HOMO-LUMO (0.85 eV) and singlet-triplet (−2.52 kcal mol^{-1}) energy gaps. Compound **3** displayed a singlet OS ground state by EPR, NMR and DFT analyses, while the dominance of quinoidal antiaromaticity for *as*-indacene core by X-ray crystallographic analysis indicates accessibility of the low-lying closed-shell (CS) structure ($\Delta E_{\text{OS-CS}} = -1.96$ kcal mol^{-1}), causing a small diradical character (30%).



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Personal Profile

Dr. Soumyajit Das received his MSc degree in chemistry from IIT Guwahati in 2007. He then joined IISER Kolkata to pursue his doctoral research under the supervision of Professor Sanjio S. Zade. In 2012, he joined Professor Jishan Wu's group at the National University of Singapore as a postdoctoral fellow. He returned to India in 2016 to work as a scientist in industry (Sai Life Sciences and Aurigene), before starting his independent career in 2019 at the IIT Ropar as an assistant professor of chemistry. His research focuses on the synthetic and physical organic chemistry of π-conjugated polycyclic (anti)aromatic molecules, and their optoelectronic applications.

Soumyajit Das
Department of Chemistry, Indian Institute of Technology Ropar, Rupnagar 140001, Punjab, India
E-mail: chmsdas@iitrpr.ac.in

PL-27
PAC Award Lecture (National)
Ball Milling– A Powerful and Green Tool for Chemical Transformations and Synthesis of Bioactive Molecules and Functional Materials

Brindaban Chandra Ranu
School of Chemical Sciences, Indian Association for the Cultivation of Science, Jadavpur, Kolkata – 700032, India; *ocbcr@iacs.res.in*

Abstract

The growing awareness of environmental implications and industrial acceptability of chemical processes lead to constant search for new green measures to reduce environment pollution and overall cost. With these objectives designing a chemical transformation in a minimum number of steps within a reasonable time is of current interest. In conventional reactions the energy used is heat from an electrical source. On the other hand electrical energy is produced mainly by the expense of fossil fuel. Thus, concept of use of minimum energy and less toxic organic solvent both in reaction and purification of product is gaining momentum.

Ball milling induced processes (Mechanochemistry) have received much attention as efficient routes in effecting various chemical reactions in a relatively green way. The mechanochemically induced reactions are often performed in the absence of solvent at ambient temperature. Usually, these reactions are carried out in milder conditions and thus sensitive functionalities are tolerated. The reactions are often faster than conventional procedures and chromatographic purifications are not needed. Many bond-forming processes and various chemical transformations leading to the synthesis of useful molecules have been accomplished by the use of the mechano-chemical technique. An account of the mechanochemically induced reactions and synthesis of various molecules will be presented.

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(a) Ball Milling Towards Green Synthesis: Applications, Projects and Challenges, Ed. B. Ranu and A. Stolle, Royal Society of Chemistry, UK, **2015**. (b) Ball-milling: An efficient and green approach for asymmetric organic synthesis – I. N. Egorov, S. Santra, D. S. Kopchuk, I. S. Kovalev, G. V. Zyryanov, A. Majee, B. C. Ranu, L. Rusinov, O. N. Chupakhin – *Green Chem.***, 2020,** *22*, 302-315. (c) Synthesis of Organosulfur and Related Heterocycles under Mechano-chemical Conditions – T. Chatterjee and B. C. Ranu, *J. Org. Chem*., **2021,** *86*, 13895. (d) Sustainable and Solvent-free Synthesis of Molecules of Pharmaceutical Importance by Ball Milling - P. Pattanayak, S. Saha, T. Chatterjee, B. C. Ranu, *Chem. Commun*, **2024,** 000, DOI: 10.1039/D4CC05127K.

Personal Profile

Professor Brindaban C. Ranu received his M.Sc. from Calcutta University and obtained his Ph.D. from Jadavpur University working with Professor U.R. Ghatak at Indian Association for the Cultivation of Science. He did his post-doctoral work in Virginia Tech, USA with Prof. T. Hudlicky during 1982-85 and started independent research at the department of Organic Chemistry, IACS from 1985. He became Professor in 1996, senior Professor in 2006 and served as Head of the Organic Chemistry department during 2003-2008. He retired from regular job in 2013 and currently is continuing as INSA Honorary Scientist in the same department. He is a fellow of West Bengal Academy of Science & Technology, Indian Academy of Sciences, Bangalore and Indian National Science Academy, New Delhi. He received the J C Bose fellowship from DST, Govt. of India. He received N.S. Narasimhan Award in 1993 and Chemical Research Society of India Silver medal in 2009 and Sir J C Ghosh Memorial award of Indian Chemical Society in 2018 among others.

His work primarily focuses on the issue of Green Chemistry. He has already published 305 papers in highly reputed international journals and currently his *h*-index is 71. Professor Ranu's works received considerable appreciation all over the world and he has been invited to deliver key note, plenary and invited lectures in symposia in India and abroad. His research on green synthesis stimulated much interest and inspiration in the chemical community, at large. Professor Ranu has also edited a book entitled, 'Ball Milling Towards Green Synthesis – Applications, Projects, Challenges' published by Royal Society of Chemistry in 2015, which received great appreciation from the practicing chemists.

Prof. Brindaban C Ranu,
School of Chemical Sciences, IACS

PL-28

New Endeavours in Asymmetric Vinylogous Reactions: Towards Functionally Rich Synthon

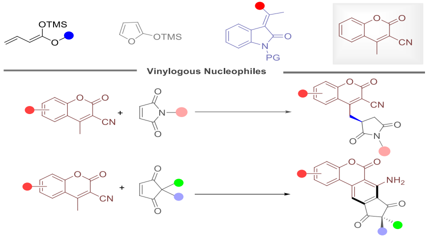
Ravi P Singh*
Department of Chemistry, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, Delhi 110016
e-mail: ravips@chemistry.iitd.ac.in

Abstract

The relay of electronic effects through a conjugated organic bonding system, such as those in a vinylogous system provides opportunity to achieve transformation at a remote place. The vinylogous nucleophile after reaction with carbonyl and carbonyl derived compounds (aldehydes, ketones, aldimines, ketimines, enals, enones, and heteroatom-stabilized carbenium ions) offer a multitude of highly functionalized structures. [1],[2],[3] It grants a synthetic track, where a number of functional group and selected stereochemistry can be established. In this presentation, a highly diastereo- and enantioselective organo catalytic asymmetric vinylogous Mukaiyama-Michael addition of various silyoxyfurans to enones,[4] and vinylogous aldol reaction of 2-silyloxyindoles to ketones, which proceeds through the bifunctional catalysis,[5] will be presented.[6]

Also, an asymmetric vinylogous Michael addition reaction between 3-cyano-4-methylcoumarins and biologically active maleimides, developed *via* non-covalent organocatalysis and enantioselective desymmetrization of cyclopentene-1,3-diones *via* [4+2] annulation will be discussed.

Figure: Vinylogous nucleophiles and representattive reactions involving these nucleophiles



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Personal Profile

Professor Ravi P Singh born in UP, India, is currently professor in chemistry department at the Indian Institute of Technology (IIT) Delhi, India. He obtained his Bachelor’s degree in chemistry from U.P. College, Varanasi and Master’s degree from Banaras Hindu University, Varanasi. Later, he moved to the Chemistry Department at IIT Kanpur, to pursue his Doctoral studies under the supervision of Prof. Vinod K. Singh. He gained his postdoctoral experience in U.S.A in the area of total synthesis and asymmetric catalysis. Dr. Singh spent two years (2005-2007) at Harvard University working with Nobel Laureate, Professor E. J. Corey and four years (2007- 2011) at Brandeis University working with Professor Li Deng. He started his independent academic career at National Chemical Laboratory -Pune as a Senior Scientist in 2011 and later moved to the chemistry department at IIT-Delhi in 2013. Research Interests: Prof. Singh’s research interest is broadly in the field of synthetic organic chemistry and specifically in Asymmetric Catalysis, C-H Activation and total synthesis of small molecules. His research group is not only pursuing various ways to make and break C-C and C-X bonds but also trying to develop strategies to synthesize biologically active and other pharmaceutically relevant natural products in a cost-effective way. Awards and Honours: • Member-2009, Sigma Xi, The Scientific Research Society, USA • ISCB YOUNG SCIENTIST AWARD-2017 IN CHEMICAL SCIENCES • CRSI Bronze Medal 2023 • Chirantan Rasayan Sanstha Research and Innovation Excellence Award 2024.

Prof. Ravi P Singh,
Indian Institute of Technology Delhi, Indi

PL-29

Exploring the potential of some natural phytochemicals for targeting epidermal growth factor receptor (EGFR) in breast cancers

Aniruddha Banerji*

Associate Professor, Post Graduate Department of Biotechnology, St. Xavier's College (Autonomous), Kolkata, 30 Mother Teresa Sarani, Kolkata-700016, INDIA, E-mail: aniruddha_banerji@yahoo.co.in

Abstract

Increased levels of epidermal growth factor receptor (EGFR) and aberrant EGFR mediated signalling has been reported to correlate with increased metastasis and a worse prognosis in breast cancers, which have highest rate of incidence of all cancers in women in India. Matrix metalloproteinases (MMPs), especially MMP-2, MMP-9 and MT1-MMP, are upregulated in breast cancers and promote cell migration and metastasis. As chemotherapy and use of synthetic inhibitors often exhibit a number of side effects and can be quite expensive, studying the potential of natural phytochemicals like curcumin and all-trans retinoic acid (ATRA) for breast cancer therapy can be of importance for the possible reduction of toxic side effects and for lowering treatment costs. Computer based analysis indicated that binding affinities of curcumin and ATRA to EGFR were appreciably higher in comparison to synthetic EGFR inhibitors like erlotinib. Binding affinities of curcumin and ATRA to molecules involved in EGFR mediated signalling, like phosphatidylinositol 3' kinase (PI3K), were also appreciable and comparable to/ higher than their synthetic inhibitors (e.g. alpelisib for PI3K). Treatment of metastatic human breast cancer cell lines cultured in presence of epidermal growth factor (EGF) with curcumin (20 µM/ml) or ATRA (20 µM/ml) for 24 hours inhibited EGFR phosphorylation and interactions of EGFR with its ligand EGF. Phosphorylation of molecules involved in EGFR mediated signalling (for instance, PI3K) were also inhibited. Binding affinities of curcumin and ATRA with catalytic domains of MMPs were higher than that of synthetic MMP inhibitors like Batimastat. Expression of MMP-2, MMP-9 and MT1-MMP and MMP-2, MMP-9 activity were significantly downregulated upon treatment of metastatic human breast cancer cells cultured in presence of EGF with curcumin or ATRA. Significant inhibition of cell migration on EGF was also observed upon such treatment. Inhibition of EGFR phosphorylation and EGFR-EGF interactions upon treatment with curcumin and ATRA could impair EGFR mediated signal transduction and cell migration. Downregulation of EGFR modulated MMP-2, MMP-9 and MT1-MMP levels upon curcumin and ATRA treatment would render cells less metastatic. Targeting EGFR-ligand interactions and EGFR mediated regulation of MMPs by treatment with the phytochemical's curcumin and ATRA could thus have important clinical and therapeutic applications in treatment of breast cancer patients..

Personal Profile

Dr. Aniruddha Banerji, M. Sc, Ph. D, is an Associate Professor in the Post Graduate Department of Biotechnology at St. Xavier's College (Autonomous), Kolkata. He completed his B. Sc with Zoology Honours from Presidency College (under University of Calcutta) and his M. Sc. in Zoology from University of Calcutta standing 1st class 1st in order of merit in both. He completed Ph. D in Life Sciences from Jadavpur University, pursuing his research at Chittaranjan National Cancer Institute, Kolkata, on the role of MMPs in tumour biology. His primary field of research involves cancer biology and his areas of research interest include the roles of cell surface receptors, matrix metalloproteinases (MMPs) and cellular cell signalling pathways in tumour metastasis and the anti-tumorigenic potential of natural phytochemical compounds. He has published 25 research papers in international and national journals and 13 book chapters. He has delivered invited lectures and oral presentations at a number of national and international seminars of repute and has successfully completed two major research projects as principal investigator. He is actively involved in research and is currently guiding a number of research fellows for their Ph. D. He has a teaching experience of over 17 years at the undergraduate and postgraduate levels and had been involved in administrative responsibilities \for over 2 years. Dr. Banerji has been honoured with a number of awards including the A.K. Bhowmick Memorial Medal from The Zoological Society, Kolkata for 1st place in B. Sc Zoology, medal from Calcutta University, for 1st place in M. Sc Zoology, award for Best Young Scientist in Molecular Biology and Genetics, at National Seminar on Dimensions in Zoological Research in Human Welfare, organized by Department of Zoology, University of Calcutta and The Zoological Society, Kolkata in collaboration with the Zoological Survey of India in 2007 and award for Best Oral Presentation, at Symposium on Recent Trends in Cancer Research & Treatment, organized by Chittaranjan National Cancer Institute in 2007. He was a member of the Executive Committee, Zoological Society, Kolkata from 2015–2019. Born into a family of academicians, he seeks to carry forth the tradition of academic excellence following in the footsteps of his grandmother, Prof. Asima Chatterjee and his parents.

Dr. Aniruddha Banerji
Associate Professor, Post Graduate Department of Biotechnology, St. Xavier's College (Autonomous), Kolkata, 30 Mother Teresa Sarani, Kolkata-700016, INDIA, E-mail: aniruddha_banerji@yahoo.co.in

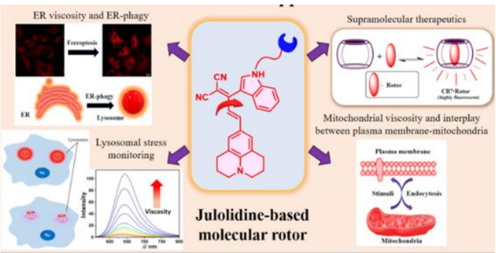
PL-30

Fluorescent molecular rotors for understanding sub-cellular stress and communication

Tanoy Dutta, Akshay Silswal, Anup Pramanik and **Apurba Lal Koner***
Department of Chemistry, IISER Bhopal, Bhopal-462066, INDIA
E-mail: akoner@iiserb.ac.in

Abstract

Subcellular viscosity is a critical parameter in cellular processes such as diffusion-controlled reactions and the proper folding of nascent proteins.[1] The analysis of this fundamental parameter within the organelles of living cells has been constrained by a lack of appropriate tools. Fluorescent molecular rotors can be utilized to detect changes in viscosity by observing variations in their fluorescence properties, which are influenced by the degree of rotation of the rotors.[2] They are effective tools for measuring and evaluating the viscosity of various biological and chemical processes.[3] However, the autofluorescence, low sensitivity, and significant phototoxicity of fluorescent probes prevent them from being used in actual, valuable applications. The current literature seeks extremely sensitive far-red emissive probes for practical usage in diagnostics and understanding the subcellular viscosity. The molecular rotors with far-red emission, high viscosity sensitivity, pH tolerance, and excellent biocompatibility have been strategically developed and synthesized in the present work. We designed Julolidine-based molecular rotor with extended conjugation and modulated the bulkiness of the rotor to produce far-red emission with enhanced sensitivity.[4] The synthesized molecular rotor is utilized to track the number of pathological conditions, including lysosomal stress, endoplasmic reticulum (ER) stress-driven by ferroptosis, mitochondrial stress, and the interplay between mitochondria and plasma membranes.[5, 6] Moreover, the molecular rotors properties are modulated and employed in drug delivery through supramolecular drug carriers.[7]



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Personal Profile

Professor Apurba Lal Koner obtained his Ph.D. in 2009 from Jacobs University Bremen, Germany under the guidance of Professor Werner M. Nau. After postdoctoral studies with Professor Mark Howarth at Oxford University (2009-2012), he started his independent career as an assistant professor at IISER Bhopal in 2012. He became full professor at the same institute in 2024. So far, he has published over 125 research articles in international journals and two patents. He guided 14 students for their Ph.D. and approximately 40 students for their master thesis. Currently, his lab is working on areas related to the development of fluorescent biomarker for disease diagnosis, chemical biological, and bio-nanotechnology.

Awards and membership:
INSPIRE Faculty Fellowship
HFSP Fellowship
Member of American Chemical Society
Member of Royal Society of Chemistry

Prof. Apurba Lal Koner
Department of Chemistry, IISER Bhopal, Bhopal-462066, INDIA
E-mail: akoner@iiserb.ac.in

PL-Wiley Sponsor Talk

Scientific publication ethics and use of Artificial Intelligence

Dr. Subhabrata Mukhopadhyay (Deputy Editor, Wiley)

Abstract

This talk will feature Wiley as a publishing house, including their collaborations with various chemical societies to promote scientific outreach and enhance research activities. We are proud of our Wiley editorial team in India, which comprises 40+ in-house editors and 45+ editorial board members from India, constantly helping develop the journals and serve the research community. In 2024, Wiley collaborated with various Indian Institutes, Universities, and Scientific Societies to organize conferences, workshops, and author events. The presentation will cover major highlights of such events and the role of Wiley's editorial team.

The talk will also focus on the conference-based special collection planned for the ICCHD-25 conference. The special collection will be conducted by the journals Asian Journal of Organic Chemistry, ChemNanoMat, European Journal of Inorganic Chemistry, and ChemistrySelect.

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Personal Profile

Subhabrata is working with the with the Wiley global team from India as a deputy editor. His primary focus is on the journals, ChemCatChem, Chemistry- An Asian Journal, ChemNanoMat, and ChemPlusChem. Additionally, he assists in developing new editorial policies and projects. Subhabrata has a strong background in materials chemistry, with a PhD from the University of Hyderabad (2020), where he worked with Prof. Samar K Das. Before joining Wiley, Subhabrata was working at Research Institute of Sweden (RISE), as a scientist on probable scale-up of academic technologies to pilot scale. He also has postdoctoral experience at Ben Gurion University in Israel (2020-2022) and Uppsala University in Sweden (2022-2023), where he published several papers in reputed journals and received prestigious fellowships for his research excellence

Dr. Subhabrata Mukhopadhyay
Deputy Editor, Wiley

PL-31

New Radical-Induced and Photooxidative Syntheses of N-Heterocycles and Alkaloids

Malte Brasholz
Institute of Chemistry, University of Rostock, 18051 Rostock, Germany
e-mail: malte.brasholz@uni-rostock.de

Abstract

Visible light-induced catalytic photooxygenations are a sustainable and synthetically elegant approach for the selective oxidation and C–H functionalization of organic compounds, and applications in industrial synthesis encompass fragrances as well as pharmaceuticals. In addition to unsaturated terpenoids, N-heterocyclic compounds in particular represent interesting substrates for photooxygenations, and following our interest in the field of indole chemistry, we developed a one-step transformation of tetrahydrocarbazoles and cycloheptaindoles to furnish novel, highly oxygenated polycyclic pyrido- and azepino[1,2-a]indoles.[1]

Azepino[1,2-a]indoles containing an α-keto-N,O-acetal substructure can be converted into α-amino-α-carbonyl radicals by photoredox-induced reductive C–O cleavage, and subsequent functionalizations with diverse SOMO-philic reactants can efficiently be implemented.[2,3] Furthermore, tricyclic enones derived from the azepino[1,2-a]indole scaffold can be utilized in organocatalytic C–C couplings and cycloadditions, which opens new avenues to structurally elaborate polycyclic oxindoles.[4]

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Personal Profile

Professor Malte Brasholz studied Chemistry at Freie Universität Berlin and obtained his PhD from the same institution in 2007, under the guidance of Prof. Hans-Ulrich Reissig. A short-term stay in the laboratory of Prof. Hisashi Yamamoto at the University of Chicago in 2008 was followed by one year of postdoctoral research in the group of Prof. Steven V. Ley at the University of Cambridge. A second year of postdoctoral studies led Malte to Australia, where he worked at CSIRO Molecular and Health Technologies in association with Prof. Andrew B. Holmes at the University of Melbourne. In 2010, he was appointed Research Scientist at CSIRO Materials Science and Engineering. From 2012, Malte established an independent research group at the Institute of Chemistry at the University of Hamburg. Since 2017 he is Professor of Organic Chemistry at the University of Rostock.

Prof. Dr. Malte Brasholz
University of Rostock, Germany
e-mail: malte.brasholz@uni-rostock.de

PL-32

Synthesis of Functionalized N-Heterocycles via Electrochemical and Annulation Reactions

Indu Bhusan Deb*
Organic and Medicinal Chemistry Division, CSIR-Indian Institute of Chemical Biology
4, Raja S. C. Mullick Road, Kolkata 700032
E-mail:indubhusandeb@iicb.res.in & indubhusandeb@gmail.com

Abstract

The ubiquitousness of dibenzoxazepines, benzazepines, benzoxazine, benzosultam, indoles and acridines in various natural products and pharmaceuticals make them immensely valuable scaffolds. Hence, the development of new and efficient methods for their synthesis and derivatization assumes high significance. Recently, we have developed several efficient and mild methodologies via direct and selective C-H functionalization employing the electrochemical, metal-catalyzed, and spiro-annulation reactions for synthesizing densely functionalized potential bioactive heterocycles. This fundamental research directed us to develop cost-effective processes for synthesizing commercially available drug molecules, which will be discussed during the presentation.

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Personal Profile

Dr. Indu Bhusan Deb obtained his M.Sc. in organic chemistry from Banaras Hindu University. He completed his Ph.D in 2008 at the Indian Institute of Technology Bombay (IITB) under the supervision of Professor I. N. N. Namboothiri. After that, he moved to Rutgers University, USA to conduct postdoctoral research with Professor Daniel Seidel, where he was involved in researching the synthesis of chiral heterocycles. After spending three years at Rutgers, he joined Professor Naohiko Yoshikai's group at Nanyang Technological University, Singapore, for his 2nd postdoctoral research. In April, 2013 He joined as a research investigator (Project leader) in the process chemistry division of Bristol-Myers Squibb Research center, Bangalore. Dr Deb worked as a senior scientist in the Organic and Medicinal Chemistry division at CSIR-IICB (Jan 2014-2018) and worked as a principal scientist from 2018 to 2022. Currently, he has been working as a senior principal scientist since Jan 2022. His research group is actively involved in asymmetric synthesis and designing synthetic methodology employing transition-metal–catalyzed C-H bond activation chemistry, metal-free reaction and Organo-electrosynthesis for the synthesis of potential bioactive small molecules.

Research Interests:

Our research group has substantially contributed in the field of catalysis in the organic chemistry area (electrochemical synthesis/C-H bond activation/functionalization) to develop affordable, efficient, and innovative as well as industry-friendly synthetic processes for the synthesis of functionalized potential bio-active molecules such as Anthrone, Benoxazine, Benzosultam, Oxaziridine, acridine, as well as Benzofuranone, employing transition metal(free)-catalysis employing the concept of electrochemical synthesis and transition metal-catalyzed C–H/C–X bond activation and metal-free C–H/C–X bond functionalizations.

Dr. Indu Bhusan Deb
CSIR-Indian Institute of Chemical Biology,
Kolkata, India
E-mail: indubhusandeb@iicb.res.in.
indubhusandeb@gmail.com

PL-33

Interaction of Curcumin and Curcumin Pyrazole with DNA G-quadruplexes

Smritimoy Pramanik*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: spchem@caluniv.ac.in

Abstract

Deoxyribonucleic acid (DNA) can form not only canonical duplex structure via A-T and G-C base pairs,[1] but also several non-canonical structures depending upon the base sequence context and environmental conditions (Figure 1A).[2,3] Among non-canonical DNA structures, four stranded G-quadruplexes emerged as a prime target for the development of novel drug molecules as it was shown to regulate crucial biological reactions.[4,5] In the presence of metal ion, guanine-rich DNA sequences self-assemble to form planar G-quartet via Hoogsteen hydrogen bonding between guanine bases (Figure 1B). Subsequently, two or more G-quartets stack on each other to form diverse DNA G-quadruplex structures depending upon loop orientation, strand orientation, length of DNA sequences, bulges, and environmental conditions (Figure 1B).[2,3] Current research has recognized clear relations between G-quadruplexes and human disease.[6] Several naturally occurring and synthetic small molecules are known to bind and alter the structure and stability of G-quadruplexes. Consequently, they are considered as potential therapeutics to target various diseases by controlling gene expression. Among the small molecules, naturally abundant low molecular weight polyphenolic compounds play a pivotal role in the field of chemical biology and medicinal chemistry due to their preventive roles in various diseases such as neurodegenerative disease, cardiovascular disease, cancer, and diabetes.[7] Curcumin is an important naturally abundant polyphenolic compound, which possesses anticancer, anti-inflammatory, anti-oxidant, and anti-cystic fibrosis properties as well as an active agent against Alzheimer's disease.[8] Consequently, we have investigated the interaction of curcumin and curcumin pyrazole with DNA G-quadruplexes. We found that curcumin has differential interaction with anti-parallel DNA G-quadruplex structures depending upon their loop orientation. Moreover, our study suggests curcumin pyrazole selectively binds to DNA G-quadruplexes even in the presence of large excess of DNA duplexes. Thus, our results might be useful not only for therapeutic intervention but also to develop novel DNA G-quadruplex structure selective ligands.

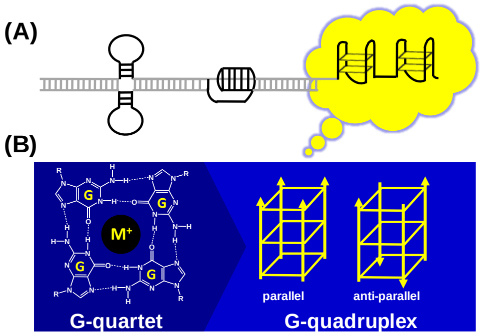

Figure 1: Schematic representation of (A) genomic DNA and (B) G-quartet and G-quadruplex.

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Personal Profile

Dr. Smritimoy Pramanik obtained his Ph.D. in 2008 from Jadavpur University under the supervision of Professor Subhash Chandra Bhattacharya. During his Ph.D. tenure he had the opportunity for a **Short-term training with Professor Hiroshi Miyasaka of the Graduate School of Engineering Science, Osaka University, Japan supported by Japan Society for the Promotion of Science.** After postdoctoral studies with Professor Naoki Sugimoto at the Frontier Institute for Biomolecular Engineering Research (2009-2015), he started his independent career at the University of Calcutta as an Assistant Professor from 2016.

Awards

JSPS **Short-term Graduate Student Delegation 2008**

DST-INSPIRE Faculty Award 2015

Dr. Smritimoy Pramanik
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: spchem@caluniv.ac.in

Special Lecture:

Marine life diversity through time: a paleoecological perspective from the Paleozoic to the Anthropocene

Giuseppe Aiello
Department of Earth Sciences, Environment and Resources, Federico II University of Naples, via Vicinale Cupa Cintia, 21, 80126 Naples, ITALY
e-mail: giuseppe.aiello@unina.it

Abstract

The fossil record and geochemical data suggest that life has been present on our planet for over four billion years. During the last part of the pre-Cambrian times (Ediacaran Period) there is an apparent increase in diversity, starting about 600 million years ago (Ma = *mega-annum*). With the beginning of the Palaeozoic Era (around 540 Ma), in the Cambrian Period, a rapid (in a geological sense) diversification took place, with the appearance of many groups of new marine organisms which colonized new habitats, filling previously unoccupied ecological niches and expanding the use of available trophic resources (a). Diversity increased in the Ordovician Period (485-420 Ma) and has continued to increase progressively up to the present. However, the paleontological, geological and geochemical evidence has shown that the process of developing a greater diversity of life was discontinuous. Phases of marked increases in diversity have been followed by drastic decreases due to various environmental changes, followed by a renewal of life. The more dramatic phases are known as "mass extinctions", including two major catastrophic events: one that marks the end of the Palaeozoic and the beginning of the Mesozoic, at about 250 Ma, and the famous paleoenvironmental crisis at about 65 Ma, which destroyed the dinosaur fauna and many other taxa.

We all live in the so-called Anthropocene, the epoch in which human impact has extended to the entire planetary ecology (b). The history of life has seen many organisms capable of modifying environmental conditions, including the chemical composition of the atmosphere, but humans have the unique capacity to know that they can drastically alter the environment.

Whether we make the Anthropocene a mass extinction or choose other strategies to adapt to the natural environment is up to us.

Our ecological and palaeoecological studies of marine micro-organisms (c, d), particularly single-celled organisms such as foraminifers and tiny crustaceans such as ostracods, show that no matter how intense the anthropogenic pressure, life does not disappear, and that diversity recovers after a period of crisis.

If we choose mass extinction, we can be sure that ostracods and foraminifers will participate in a new diversification of life, but we cannot be sure that the human species will participate.

The choice seems to be in our hands.

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Personal Profile

Giuseppe Aiello, obtained his Ph.D. in Sedimentary Geology in 1998 from the University of Naples "Federico II", with a thesis titled Paleoecology and Biostratigraphy of the Tortonian-Pliocene Ostracod Assemblages of Central-Northern Calabria. After completing his Ph.D., he carried out research at the Polska Akademia Nauk in Warsaw, Poland, from 1998 to 1999, before returning to the University of Naples "Federico II". In 2018, he was appointed Researcher and, in 2020, Associate Professor in Paleontology at the same institution. He is currently a Professor of Paleontology and Paleoecology in the Department of Earth Sciences at the University of Naples "Federico II".

His scientific interests focus on paleontological and ecological studies of ostracods (Ostracoda: Crustacea), benthic foraminifera (Foraminifera: Retaria), and, to a lesser extent, planktic foraminifera from the Miocene to the Recent. His research has extensively explored the taxonomy, paleoecology, and biostratigraphy of marine Miocene, Pliocene and Quaternary ostracods from central and southern Italy, including sedimentary successions deposited in volcanic areas (Phlaegrean Fields, Vesuvius) and in archaeological sites (Pompeii, Salerno). He has also investigated the taxonomy and paleoecology of marine Miocene ostracods of Central Paratethys (Poland) and Eastern Atlantic (Morocco).

In addition, he has worked on the taxonomy and ecology of marine ostracod assemblages from the Mediterranean area and the Western Atlantic (Brazil).

Further, he has conducted paleoenvironmental studies based on marine and nonmarine calcareous and siliceous meiofaunal assemblages, including benthic foraminifers and ostracods, from Greek Quaternary successions and archaeological sites of the Campania Region. His work also addresses the morphological inter- and intra-specific variability of ostracod shell features and the ecological responses of benthic foraminiferal and ostracod assemblages to anthropogenic impacts in Italian coastal areas.

Prof. Giuseppe Aiello
University "Federico II" Naples, Italy
Email: giuseppe.aiello@unina.it

PL-34

Visualization of Excited State Intramolecular Proton Transfer (ESIPT) in benzimidazole based chemosensors

Riya Bag[1], Yeasin Sikdar[2], Sutapa Sahu[1], **Sanchita Goswami[1,*]**
[1]*Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA*
[2]*Department of Chemistry, The Bhawanipur Education Society College, Kolkata*
E-mail: sgchem@caluniv.ac.in

Abstract

The realm of chemosensors presents great potential for the development of selective, sensitive, robust, low-cost and fast responding molecular probes for real time detection and measurement of analytes. Benzimidazole based moieties have gained increasing attention due to the successful application in designing fluorescent and colorimetric probes. I would like to highlight the following probes during my discussion as they demonstrate beautifully the phenomenon of Excited State Intramolecular Proton Transfer (ESIPT). 2–{[3–(1H–benzoimidazol–2–yl)–2–hydroxy–5–methyl–benzylidene]–amino}–benzoic acid (**H_2BIo**), 4–{[3–(1H–benzoimidazol–2–yl)–2–hydroxy–5–methyl–benzylidene]–amino}–benzoic acid (**H_2BIp**) and 5–{[3–(1H–benzoimidazol–2–yl)–2–hydroxy–5–methyl–benzylidene]–amino}–isophthalic acid (**H_3BIdm**) have been constructed by using –ortho, –para and –meta substituted amino benzoic acids and their ESIPT properties as well as sensing behavior have been studied extensively.

References:

R. Bag, Y. Sikdar, S. Sahu, M. M. Islam, S. Mandal, S. Goswami, *Chem. Eur. J.* **2023**, *29*, e202203399.

Personal Profile

Dr. Sanchita Goswami obtained her Ph.D. in 2007 from Indian Association for the Cultivation of Science (IACS), Kolkata under the guidance of Professor Pradyot Banerjee. After a short stint in S. A. Jaipuria College as Lecturer, she joined at the Department of Chemistry, University of Calcutta in 2010 and currently serving as an Associate Professor.

Her research interests involve construction of heterometallic (3d-4f) magnetic materials and quest for Single Molecule Magnets (SMMs). Her research laboratory is actively involved in designing chemosensors for biologically relevant cations/anions.

Memberships:

- Life member of Indian Chemical Society (Membership No. 7350)
- Life member of Indian Physical Society (Membership No. 0828)
- Life member of Indian Science News Association (Membership No. 3165)
- Annual member of American Chemical Society (Membership No. 30801704)
- Associate member of Royal Society of Chemistry (Membership No. 584258)

Dr. Sanchita Goswami
Department of Chemistry,
University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: sgchem@caluniv.ac.in

(RSC Sponsor Talk)

RSC: Building Community

Dr. Rajdip Roy

MRSC
Membership Executive - External Relationships
Royal Chemistry India Private Limited
A subsidiary of The Royal Society of Chemistry
The Regus, Unit No. 2201A, 22nd Floor, World Trade Centre
Brigade Gateway Campus, 26/1, Dr. Rajkumar Road
Malleswaram, Bangalore - 560055, Karnataka, India
T: +91 80-23256515 | M: +91 98305 00904 | W: www.rsc.org

Abstract

The **Royal Society of Chemistry** (**RSC**) is a **learned society** with the goal of "**advancing the chemical sciences**" in our day-to-day life keeping in mind the importance of chemistry in our society. RSC provides a unique platform to connect students, teachers, researchers, scientists together for the development and recognition of professional capabilities and to publish new cutting-edge research. Being an UK organization, with the headquarters located in Cambridge and London, RSC has now extended its global offices to all over the world and since 2010, RSC India office has been actively operating from Bengaluru. With more than **2,500 members** and **2nd highest article submissions & articles published across all RSC journals in 2023 from India**, RSC is also constantly trying to engage the chemical community here in India with **publishing**, **social**, **educational outreach** and **membership activities** in India specific way. My talk would holistically cover all these aspects of the Royal Society of Chemistry.

Personal Profile

Dr. Rajdip Roy works as a Membership Executive at the Royal Society of Chemistry India office since October 2022. His main areas of work are on meeting people associated with chemical sciences, interacting with scientific community, organizing conferences to encourage them to be a part of the RSC so that they could be able to get a unique platform to connect each other for the development and recognition of professional capabilities and to publish new cutting-edge research.

Rajdip had completed his PhD in Organic Supramolecular Chemistry and Chemical Crystallography from Indian Association for the Cultivation of Science, Kolkata, India in 2017. He had a few postdoctoral stints in The Hebrew University of Jerusalem, Israel, and University of Notre Dame, IN, USA and IACS Kolkata during 2017 to 2022.

Dr. Rajdip Roy
MRSC
Membership Executive - External Relationships
Royal Chemistry India Private Limited

PL-35

Harnessing Carbene/Nitrenes for Drug Discovery

Prakash Kafle, Rishav Mukherjee, Deacon Herndon and **Indrajeet Sharma***
Department of Chemistry and Biochemistry, University of Oklahoma,
101 Stephenson Parkway, Norman, Oklahoma-73019, USA
e-mail: isharma@ou.edu

Abstract

In recent years, the field of drug discovery has faced a significant hurdle: a slowdown in the rate of discovering new drugs coupled with a notable escalation in development costs.[1] This deceleration primarily stems from the limited diversity of drug discovery libraries, underscoring the urgent need to explore new territories within chemical space. In light of this, the Sharma research group has directed its efforts towards scaffold hopping, a strategy involving creating novel chemical entities from existing ones. While scaffold hopping has been under investigation since the late 20th century, it has predominantly been pursued through virtual means, with only a few synthetic approaches explored. Contemporary scaffold hopping methodologies often impose stringent conditions, utilizing unstable reagents and oxidizing agents, thereby restricting their applicability to delicate functional groups. Our research endeavors aim to overcome these limitations by pioneering novel techniques employing carbenes and nitrenes. Unlike previous methodologies, our carbene/nitrene precursors are stable at benchtop conditions and do not necessitate harsh reagents, facilitating the site-selective addition of carbon or nitrogen atoms. This advancement enables transformations such as converting pyrroles into pyridines/pyrimidines or indoles into quinolines/quinazolines.[1,2] By harnessing ^{15}N-sulfenylnitrenes, we further enable the synthesis of isotopically labeled ^{15}N-heterocycles, serving as invaluable tools for drug discovery applications.

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(3) Ghosh, B; Kafle, P; Mukherjee, R; (equal contributors BG, PK, RM); Welles, R; Herndon, D; Nicholas, K.M.; Shao, Y; Sharma, I." Science 2024 (Accepted); ChemRxiv, Preprint DOI: 10.26434/chemrxiv-2024-f80wf-v2

Personal Profile

Indrajeet Sharma is an Associate Professor in the Department of Chemistry and Biochemistry at the University of Oklahoma and currently serves as the 2024 Chair of the American Chemical Society-Oklahoma Section. He earned his M.Sc. from the Indian Institute of Technology, Kharagpur, and completed his Ph.D. in glycopeptide chemistry under the guidance of Prof. David Crich, graduating in 2011 from Wayne State University. Dr. Sharma then undertook a Lucille Castori Fellowship at Memorial Sloan-Kettering Cancer Center with Prof. Derek S. Tan before joining the University of Oklahoma in 2014.

Dr. Sharma's research centers on developing innovative synthetic methods leveraging metal-carbene chemistry for applications in total synthesis and drug discovery. His work has garnered substantial funding from prestigious agencies, including the NIH, NSF, DOD, ACS-PRF, and the Oklahoma Center for Science and Technology (OCAST). The findings from his research have been published in high-impact journals such as ACS Catalysis, Nature Communications, and Science.

Prof. Indrajeet (Inder) Sharma
University of Oklahoma, USA
e-mail: isharma@ou.edu

PL-36

Novel Reaction and Structural Chemistry of Hypervalent Iodine Compounds

Prof. Naohiko Yoshikai
Graduate School of Pharmaceutical Sciences, Tohoku University, Sendai 980-8578, Japan
e-mail: naohiko.yoshikai.c5@tohoku.ac.jp

Abstract

Hypervalent iodine compounds have long fascinated organic chemists due to their unique reaction and structural chemistry, as well as their valuable applications, especially as oxidants and electrophilic group-transfer reagents in organic synthesis. This presentation will primarily focus on trivalent iodine compounds acting as organometallic-like nucleophiles toward arynes,[1,2] a discovery that emerged over the course of our exploration of novel vinyl- and arylbenziodoxoles.[3,4] These carbo- and hetero-iodanation reactions can forge various aryl–carbon and aryl–heteroatom bonds, along with the concomitant formation of an aryl–iodine(III) bond, under mild conditions. The newly formed aryl–iodine(III) bond serves as a versatile handle for further transformations. In addition to these reactions, our recent exploration of the carbon–iodine bond as a novel element of chirality will also be disclosed.[5]

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5. Abe, S.; Kikuchi, J.; Matsumoto, A.; Yoshikai, N. ChemRxiv 2024, DOI: 10.26434/chemrxiv-2024-t16qt.

Personal Profile

Prof. Naohiko Yoshikai obtained his Ph.D. in 2005 from University of Tokyo under the guidance of Professor Eiichi Nakamura. After working as an Assistant Professor at the same university (2005-2009), he moved to Singapore in the summer of 2009 to start his independent career as a Nanyang Assistant Professor at Nanyang Technological University (NTU). He was promoted to an Associate Professor with tenure at NTU in 2016. In the spring of 2021, he returned to Japan to join Tohoku University as a Full Professor.

Awards:
Mukaiyama Award, The Society of Synthetic Organic Chemistry of Japan (2022)
TCI–Singapore National Institute of Chemistry (SNIC) Industry Award in Synthetic Chemistry (2020)
Chemical Society of Japan Award for Young Chemists (2014)

Prof. Naohiko Yoshikai
Tohoku University, Japan
e-mail: naohiko.yoshikai.c5@tohoku.ac.jp

PL-37

Advances in Upcycling Polyethylene: Exploring E-CO Copolymerization through DFT Calculations for Sustainable Solutions

Lucia Caporaso
Department of Chemistry and Biology, University of Salerno, Italy
e-mail: lcaporaso@unisa.it

Abstract

Petroleum-based plastics, especially polyethylene, play a key role in the global economy, with extensive applications in sectors such as packaging, construction, transportation, electronics, and healthcare.(1a) However, the chemical inertness of these materials has led to severe environmental pollution, adversely affecting human health, ecosystems, and the sustainable use of carbon resources. Traditional mechanical recycling methods are limited by significant technological and economic challenges, creating a need for more efficient and sustainable solutions. One promising approach to address these issues involves introducing a low breakpoint density in polyethylene during the polymerization process. This technique can facilitate chemical recycling or targeted upcycling of the material and also has the potential to reduce the persistence of plastic waste in the environment, promoting closed-loop recycling systems.(1b,1c) Recent developments have led to more sustainable, degradable polyethylene materials, achieved using advanced Ni(II) phosphine phenolate catalysts and incorporating small amounts of carbon monoxide during polymerization. This process introduces keto-units within the polymer chains, conferring photodegradability, which could help mitigate the long-term environmental impact of polyethylene waste without significantly altering its mechanical properties.(1d,1e) The reaction mechanism was elucidated through a theoretical DFT study, showing that non-alternating CO incorporation is favored by a balance of electronic and steric factors. Specifically, moderate steric hindrance from the phosphine moiety promotes the desired non-alternating pathway, while electronic donation to the metal center prevents the formation of overly stable chelates, which would otherwise reduce catalytic efficiency and favor the undesired alternating incorporation. (1f, 1g)

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Personal Profile

Lucia Caporaso obtained her Ph.D. in Chemistry in 1996 from the University of Naples Federico II, under the supervision of Prof. P. Corradini. After completing her postdoctoral research at the University of Verona (1998–2000) and at the University of Salerno (2000–2004), she began her academic career at the University of Salerno, where she served as Assistant Professor in Industrial Chemistry in the Department of Chemistry and Biology from 2004 to 2017. In 2017, she was appointed Associate Professor of Industrial Chemistry at the same institution. She has also obtained three full professorship national habilitations in the fields of Inorganic Chemistry, Industrial Chemistry, and Principles of Chemical Engineering.

Prof. Lucia Caporaso
Salerno University, Italy
e-mail: lcaporaso@unisa.it

PL-38

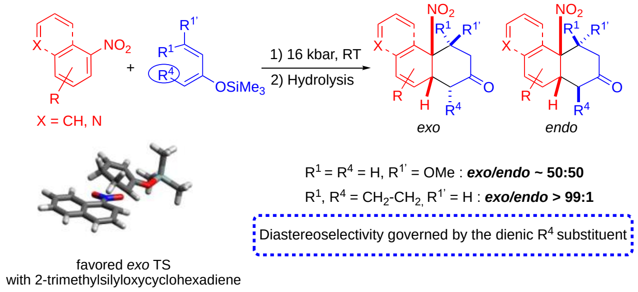
Dearomatizing Diels-Alder Reactions of Nitroarenes with Silyloxydienes. DFT as a Tool to Control Diastereoselectivity

Frison, G. ; Rkein, B. ; Roseau, M. ; Legros, J. ; Harrowven, D., **Chataigner, I ;***

Sorbonne Université, CNRS, Laboratoire de Chimie Théorique, LCT, F-75005 Paris, France and COBRA UMR 6014, Univ Rouen Normandie, F-76000 Rouen, France
e-mail: isabelle.chataigner@upmc.fr

Abstract

Dearomatization strategies have the potential to convert planar substrates into complex (poly)cyclic three-dimensional molecules in a single step by disruption of the planar aromatic □-system. Cycloaddition reactions involving aromatic C=C bonds as 2□□--electron partners have become increasingly popular in recent years and we have shown that Diels-Alder cycloaddition reactions between nitroarenes and silyloxydienes can be induced under high pressure activation, without the need for any chemical activator/catalyst.[a] In some cases, however, the endo/exo diastereoselectivity remained low. Thanks to DFT calculations, used as an a priori tool, we have recently been able to increase this selectivity and have shown that an exquisite exo-diastereoselectivity is achievable with silyloxycyclohexadiene.[b] In this case, the exo approach is characterized by less distortion of the substrates in a late TS and by more favorable orbital interactions presumably between the nitro group and the dienic moiety, explaining the stereoselectivity. Results of these studies will be presented.



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Personal Profile

Professor Isabelle Chataigner obtained her Ph.D. in 1997 from the university of Nantes under the guidance of Dr. Jean Villiéras. After postdoctoral studies with Professor Cesare Gennari at the University of Milan (1998-1999), she started her career at the University of Rouen Normandie as associate professor. She obtained her Habilitation from this university in 2009 and became Full Professor at the University of Rouen Normandie in 2013. She has additionally, since 2017, a CNRS temporary position at the Laboratoire de Chimie Théorique, Sorbonne Université, Paris, France.

Visiting Professorships at Tohoku University (Sendai, Japan, 2016), at Osaka Prefecture University (Sakai, Japan, 2018).

Professor Isabelle Chataigner
Sorbonne Université, CNRS, Laboratoire de Chimie Théorique,
LCT, F-75005 Paris, France and COBRA UMR 6014, Univ Rouen
Normandie, F-76000 Rouen, France.
e-mail: isabelle.chataigner@upmc.fr

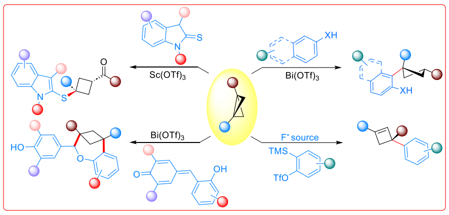
PL-39

Lewis Acid-Catalyzed Reactions of Bicyclo[1.1.0]butanes (BCBs) for the Synthesis of Functionalized Bicyclic Frameworks

Akkattu T. Biju
Department of Organic Chemistry, Indian Institute of Science, Bangalore-560012, India
E-mail: atbiju@iisc.ac.in

Abstract

The versatile reactivity of bicyclo[1.1.0]butanes (BCBs) makes them an attractive choice for synthesizing decorated cyclobutanes or functionalized bicyclic frameworks.[1] In this context, we have recently demonstrated the nucleophilic reactivity of BCBs in Lewis acid-catalyzed highly diastereoselective ring-opening reactions with naphthols.[2] Moreover, BCBs were also effectively utilized in ene reactions: in one instance, BCBs act as the ene component when reacting with in situ generated benzynes,[3] while in another case, they function as enophiles under Lewis acid catalysis with thioindolinones.[4] Additionally, the synthesis of oxabicyclo[4.1.1]octanes via Lewis acid-catalyzed (4+3) annulation with *para*-quinonemethides has also been realized.[5] Further, the Lewis acid-catalyzed reaction of BCBs with isatogens and ynamides has also been developed recently.[6,7] The construction of these highly decorated cyclic frameworks, along with the diverse reactivity patterns of BCBs, will be presented.



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7. Sarkar, D.; Deswal, S.; Das, R. C.; Biju, A. T. *Chem. Sci*. **2024**, *15*, 16243.

Personal Profile

A. T. Biju received his M. Sc. from Sacred Heart College Thevara (affiliated to MG University, Kerala, India) and Ph.D. under the guidance of *late* Dr. Vijay Nair at the CSIR-NIIST (Formerly RRL), Trivandrum, India. Subsequently, he was a post-doctoral fellow with Prof. Tien-Yau Luh at the National Taiwan University, Taipei and an Alexander von Humboldt fellow with Prof. Frank Glorius at the Universität Münster, Germany. In June 2011, he began his independent research career at the CSIR-National Chemical Laboratory, Pune. In June 2017, he moved to the Department of Organic Chemistry, Indian Institute of Science, Bangalore, where he is a professor presently. His research focuses on developing strategies using N-heterocyclic carbene (NHC) organocatalysis, and strain-release driven reactions of arynes, donor–acceptor cyclopropanes and bicyclobutanes.

Editor, *J. Heterocyclic Chem.*
Advisory Board, *Chem. Commun.*
Advisory Board, *Org. Chem. Front*.
Advisory Board, *SynLett.*
International Advisory Board, *Asian J. Org. Chem*.
Editorial Board, *Green Synth. Catal.*
Subject Editor, *Current Science Journal*, Indian Academy of Sciences

Akkattu T. Biju
Department of Organic Chemistry, Indian Institute of Science, Bangalore-560012, India
E-mail: atbiju@iisc.ac.in

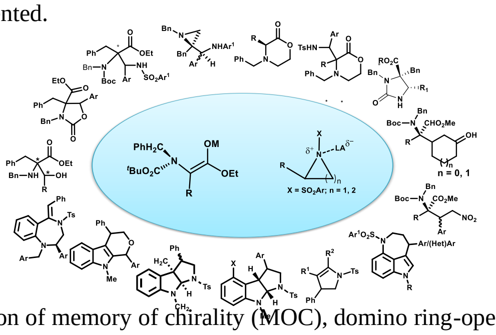
PL-40

Synthesis of bioactive molecules using MOC, DROC and ROC Strategies

Amit Kumar Sharma, Suraj Kashyap, Bharat Singh, Manish Kumar and **Manas K. Ghorai***
Department of Chemistry, Indian Institute of Technology Kanpur, Kanpur-208016, INDIA
E-mail: mkghorai@iitk.ac.in

Abstract

Aza- carba- and oxacycles are important structural motifs present in various natural products and bioactive compounds. Recently, we have developed an elegant strategy for the stereoselective synthesis of substituted α,β-diamino acids, β-hydroxy α-amino acid derivatives, oxazolidinones, aziridines etc. following memory of chirality (MOC) concept.We have demonstrated that in the presence of a Lewis acid catalyst, aziridines and azetidines undergo nucleophilic ring-opening transformations with an appropriate nucleophile following an SN2-type pathway. By exploiting and exploring our protocols of domino-ring-opening-cyclization (DROC) and ring-opening-cyclization (ROC), several novel strategies for the synthesis of non-racemic N/O-heterocycles of contemporary interest have been developed. The progressive development of this chemistry over more than two decades, mostly during the last five years, in terms of further mechanistic investigations, enhanced enantio- and diastereoselectivity, kinetic and dynamic kinetic resolution, and important applications in asymmetric organic synthesis will be presented.



Scheme 1. Synthetic exploration of memory of chirality (MOC), domino ring-opening cyclization (DROC) and ring-opening cyclization (ROC) of small ring Aza/oxa-heterocycles.

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Personal Profile

Prof. Manas K. Ghorai completed his B.Sc. (Hons.) from the University of Calcutta in 1989 and M.Sc. from IIT Kharagpur in 1991. He earned his Ph.D. in 1998 under Prof. Ganesh Pandey at NCL, Pune. Following his doctoral studies, he pursued postdoctoral research with Prof. Michael Schmittel at the University of Wuerzburg, Germany (1998-2000), as an Alexander von Humboldt fellow at the University of Siegen (2000-2001), and with Prof. JoAnne Stubbe at MIT, USA (2001-2002). In 2002, Prof. Ghorai joined IIT Kanpur's Department of Chemistry as an assistant professor. He became associate professor in 2007, full professor in 2012, and HAG professor in 2019. He also held the position of USV Chair Professor. Currently he is N. C. Nigam Chair Professor. His research focuses on Asymmetric Synthesis via SN2-Type Ring-Opening of Small Ring Aza/Oxa-Heterocycles/carbocycles, Memory of Chirality, Domino Reactions in Enolate Anion and Dianion Chemistry, Organo-Catalysis, Photo-Redox Catalysis, Kinetic and Dynamic Kinetic Resolution and Material Chemistry.

Awards and Honors

1. Fellow of National Academy of Sciences (FNASc.)
2. Indian Academy of Sciences (FASc.)
3. Fellow of West Bengal Academy of Science and Technology (FAST).
4. Recipient of Dr. S. Rajappa Award and Agharkar Birth Centenary Gold Medal.

Prof. Manas K. Ghorai,
IIT Kanpur, India
E-mail: mkghorai@iitk.ac.in

PL-41

Greener Synthesis of Substituted Quinolines and Polycyclic Heteroaromatics

Abu T. Khan
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, INDIA
E-mail: atk@iitg.ac.in

Abstract

Organic synthesis lies at the core of every advanced technology in our modern world, in a desire to improve the life of humankind and explore the databank of novel molecules. In this rapid growth, green chemistry is necessary for safer chemical synthesis to reduce the environmental damage caused by using hazardous chemicals and solvents. In that case, multi-component and cascade reactions have been widely recognized to cut costs, decrease solvent usage, and reduce cycle times in chemical processes embracing greener organic synthesis.Quinoline, a highly versatile and privileged nitrogen-containing heterocycle, is prominent in drug discovery. In this lecture, the synthesis of substituted quinoline derivatives and polycyclic heteroaromatics (PHAs) and the reaction mechanisms for forming products will be discussed utilizing readily available starting materials through environmentally benign synthetic pathways.

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5.A. Mandal and A. T. Khan, Org. Biomol. Chem. 2024, 22, 2339-2358 and references therein.

Personal Profile

Professor Abu T. Khan was born on 20th November 1961, in West Bengal. He obtained his PhD Degree (1990) from Kalyani University in Synthetic Organic Chemistry under the guidance of Professor Dr. K. C. Majumdar. He carried out his first postdoctoral research work for a period of two and half years with Professor Dr. Goverdhan Mehta at the School of Chemistry at Hyderabad Central University. Then, he was awarded the prestigious AvH fellowship in 1992 to pursue his second postdoctoral research work with Professor Dr. Richard R. Schmidt at the University of Konstanz, Germany. After returning to India, he joined as a Scientist Fellow at RRL Jorhat, presently known as NEIST Jorhat. Later, he moved to IIT Guwahati as an Assistant Professor on 23rd December 1996. He was promoted to full Professor on 20th March 2004, and presently, he has been serving as HAG Professor since April 2010. He has supervised 30 B. Tech., 35 M. Sc. and 30 PhD students. He has published 175 research papers in various reputed international and national journals. On Government Deputation, he served as the Faculty In-Charge & Dean of Faculty Affairs at IIT Patna from July 2009 to 31st December 2012 to set up the institute and the Vice-Chancellor of Aliah University, Kolkata, from October 2013 to September 2017. His current research interests are green chemistry, new synthetic methodology, new brominating reagents, synthesis of heterocycles using MCRs, carbohydrate chemistry, reaction mechanism and total synthesis of natural products.

Professor Abu T. Khan
Indian Institute of Technology Guwahati,
Guwahati-781039, Assam, INDIA
E-mail: atk@iitg.ac.in

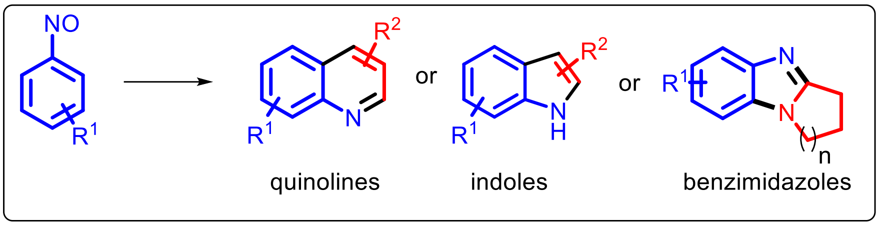
PL-42

Switching Nitrone Reactivity: Arene Functionalization of Nitrosoarenes

Chandan K. Jana
Department of Chemistry, IIT Guwahati, Guwahati, Assam-781039, INDIA
E-mail: ckjana@iitg.ac.in

Abstract

Nitrosoarenes participate in a wide variety of reactions to incorporate nitrogen and/or oxygen functionality in a molecule. In most cases, the arene moiety of the nitrosoarene is sacrificed in order to get the desired hetero functionality. However, the reactions of nitrosoarenes that functionalize the arene moiety incorporating it into the product are underdeveloped. Our group aimed to develop reactions that functionalize the arene moiety of the nitrosoarene. Nitrones are well known to react with alkene via [3+2] cycloaddition reaction. We could switch the mode of reactivity of the nitorne from [3+2] to [4+2] in order to achieve arene functionalization of nitrosoarenes. The methods developed in our group for the synthesis of important fused aromatic heterocycles via arene functionalization of nitrosoarene will be discussed.



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Personal Profile

Professor Chandan K. Jana received his Ph.D. degree from the group of Prof. A. Studer at the University of Muenster, Germany, in 2008, as a member of the International Graduate School of Chemistry. He was a postdoctoral fellow with Prof. K. Gademann at EPFL and the University of Basel, Switzerland (2009–2011). In 2011, he started his independent research career as an Assistant Professor in the Department of Chemistry at the Indian Institute of Technology Guwahati, where he became Professor in 2019. His research and teaching focus on organic chemistry.

Awards

04/2023 SERB - Science and Technology Award for Research (SERB-STAR), Government of India
07/2012 DAE Young Scientist Research Award, Government of India,
04/2009 – 05/2011 Swiss National Postdoctoral fellowship
10/2005 – 10/2008 Ph.D. fellowship of the International Graduate School of Chemistry (GSC-MS), University of Muenster, Germany
07/2002 – 09/2005 M S scholarship of Indian Institute of Science (IISc), Bangalore, India
09/2004-National scholarship of University of Calcutta, India

Prof. Chandan K. Jana
Department of Chemistry, IIT Guwahati, Guwahati, Assam-781039, INDIA
E-mail: ckjana@iitg.ac.in

PL-43

Quinazoline and Quinoline Based Small Molecules as Utrophin Upregulator via AhR Antagonism for the Treatment of Duchenne Muscular Dystrophy

Surojit Ghosh, Mohammad Umar Arshi, Satyajit Ghosh, Moumita Jash, Samya Sen, Kamel Mamchaoui, Sudipta Bhattacharya, Nirmal Kumar Rana, and **Surajit Ghosh***
Department of Bioscience and Bioengineering, Indian Institute of Technology Jodhpur, NH-62
Nagaur Road, Karwar, Jodhpur-342030, Rajasthan, INDIA
Email: sghosh@iitj.ac.in

Abstract

Duchenne muscular dystrophy (DMD) is a fatal muscle-wasting disease caused due to absence of cytoskeletal protein dystrophin. Upregulating utrophin, a paralogue protein of dystrophin, is one of the potential therapeutic strategies for the treatment of DMD disease independent of mutation type. This presentation will focus on the design, synthesis, and validation of novel Quinazoline and Quinoline based small molecules as potent utrophin modulators that upregulate utrophin at nanomolar range in C2C12 cell line. Hit molecule SG-02 identified from a library of seventy molecules synthesized upregulates utrophin upto 2.7 fold at 800 nM range in dose dependent manner. Also, SG-02's potential was validated in a human cell line derived from DMD patients, demonstrating a significant utrophin expression by 2.3- fold. Mechanistically, SG-02 functions as an AhR antagonist, binding with an apparent Kd of 41.68 nM. Additionally, SG-02 enhances myogenesis, as validated by increased Myosin heavy chain (MHC) expression through immunocytochemistry. Preliminary ADME evaluation supports SG-02 as a potential oral bioavailable small molecule. Altogether, SG-02 has enormous potential to emerge as a suitable drug candidate for treating the global DMD population, irrespective of the type of mutations.

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Personal Profile

Professor Surajit Ghosh obtained his PhD from Indian Institute of Technology, Kanpur in the year of 2008 under the guidance of Prof. Sandeep Verma. After completing his PhD, he received postdoctoral fellowship at Cell Biology and Biophysics Division of European Molecular Biology Laboratory, Heidelberg, Germany with Dr. Thomas Surrey, where he worked on organization of microtubule and molecular motor proteins till December 2010. He joined CSIR-Indian Institute of Chemical Biology Kolkata, India in 2011, and worked as Principal Scientist till July 2019. Subsequently, he has joined as Professor in the Department of Bioscience and Bioengineering at Indian Institute of Technology Jodhpur in July 2019. He is a recipient of BIOCON Tribute award, EMBL Fellowship, Alexander von Humboldt Fellowship, Ramanujan Fellowship, Indian Peptide Society Young Scientist Award, Asima Chatterjee Young Scientist Award, CSIR-CDRI Award for Excellence in Drug Research (2020) and SERB-STAR Award (2020). He is an elected Fellow of Royal Society of Chemistry (2016), and West Bengal Academy of Science and Technology (2018). He became editorial board member of RSC Advances (2022) and serving as Associate Editor of RSC Advances (2015-2025) and Frontiers of Chemistry (Chemical Biology). At IIT Jodhpur he is leading his group with a current research focus on the areas of Chemical Neuroscience, Chemical Biology and Development of Biophysical Platform/Biosensor.

Surajit Ghosh
Department of Bioscience and Bioengineering, Indian
Institute of Technology Jodhpur, NH-62
Nagaur Road, Karwar, Jodhpur-342030, Rajasthan,
INDIA
Email: sghosh@iitj.ac.in

PL-44

Development of Novel Bioactive Small Molecules from Synthetic and Natural Sources for Infectious and Non-Infectious Diseases

Dr. Parasuraman Jaisankar
Chief Scientist & HoD
Organic and Medicinal Chemistry Division
CSIR-Indian Institute of Chemical Biology (Ministry of Science & Technology,
Govt. of India), Kolkata – 700 032. Email: jaisankar@iicb.res.in

Abstract

The development of bioactive molecules with specific therapeutic and diagnostic targets is critical for addressing the global burden of diseases. Our research group focuses on three core areas: Chemical Biology, Natural Product and Synthetic Chemistry, and Chiral Chemistry and Catalysis. These efforts are directed toward designing agents for a diverse spectrum of infectious and non-infectious diseases. Additionally, we have made pioneering advancements in the development of organo- and enzymatic-catalytic systems for the asymmetric synthesis of organic molecules.This talk will highlight our group's significant contributions to discovering therapeutic agents from medicinal plants such as *Andrographis paniculata* (Burm. f.) Nees and *Andrographis nallamalayana* J.L. Ellis. Traditionally used for treating ailments like mouth ulcers, fever, inflammation, and snake bites, these plants have been evaluated for their potential against diseases such as leishmaniasis, Chagas disease, cancer, and Alzheimer's disease. We conducted comparative studies on the in vitro cytotoxic activity and phytochemical profiling of methanol extracts of *A. nallamalayana* (ANM) and *A. paniculata* (APM).Further, I will present our progress in developing synthetic inhibitors targeting specific biomolecules implicated in cancer, ulcers, and metabolic disorders. A key highlight is the identification of inhibitors targeting MMP9, a promising strategy for treating ulcers and inflammatory diseases. This work, featured as cover art in the *Journal of Medicinal Chemistry*, has led to securing both national and international patents.

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2.Anushree Achari, Sourav Chatterjee, Sudip Dey, Tapas K Kundu, **Parasuraman Jaisankar***, *Organic & Biomolecular Chemistry*, **2023**, *21(1)*, 89-92.

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4.Narender Goel, Aakri Garg, Chennuru Nagendra, Araveeti Madhusudhana Reddy, Raju Biswas, Ramalingam Natarajan, **Parasuraman Jaisankar,*** *J. Mol. Structure,* **2024**, 1301, 137406.

Personal Profile

Prof. Parasuraman Jaisankar is a Chief Scientist and Head of the Department of Organic and Medicinal Chemistry at the CSIR-Indian Institute of Chemical Biology (CSIR-IICB), Kolkata. He completed his Ph.D. in Synthetic Organic Chemistry from Jadavpur University, Kolkata, in 1995. He subsequently pursued postdoctoral research at the University of Ulm, Germany, as a DAAD Fellow with Prof. Hartmut Seliger from 1996 to 1998, and later at Nagoya University, Japan, as an RCMS Fellow with Nobel Laureate Prof. Ryoji Noyori's Research Group from 2001 to 2002. Since 1990, he has been carrying his research as Scientist at CSIR-IICB, Kolkata, and has led the Department of Organic and Medicinal Chemistry since 2015. Prof. Jaisankar has also held Visiting Scientist positions at Nicolaus Copernicus University (Poland), Technische Universität München (Germany), National Changhua University of Education (Taiwan), and St. Jude Children's Research Hospital (USA) as a Fulbright Fellow.

Prof. Jaisankar is a Fellow of the Royal Society of Chemistry (FRSC), UK; a Fulbright Fellow, DAAD Fellow, elected Fellow of the Institution of Chemists (FIC); Fellow of the West Bengal Academy of Science & Technology (FAScT); Raman Research Fellow; President of the Royal Society of Chemistry (Eastern India Section), UK; Founder Member and Vice-President of the Chemical Biology Society (CBS), India; and Global Chair of the International Chemical Biology Society (ICBS). His research focuses primarily on chemical biology to investigate and address cellular and molecular mechanisms in complex disease states. He has developed numerous lead molecules targeting both infectious and metabolic diseases. Currently, he serves as an Associate Editor for *Frontiers in Chemistry*. He has supervised over 32 Ph.D. students and 34 postgraduate and undergraduate students, published more than 117 research articles, authored 3 book chapters, and holds 17 national and international patents. Since 2016, he has been associated with NGCMA and is among the leading GLP inspectors in the country.

Prof. Parasuraman Jaisankar,
Chief Scientist & Head, CSIR-Indian Institute of
Chemical Biology, Kolkata, India
Email: jaisankar@iicb.res.in

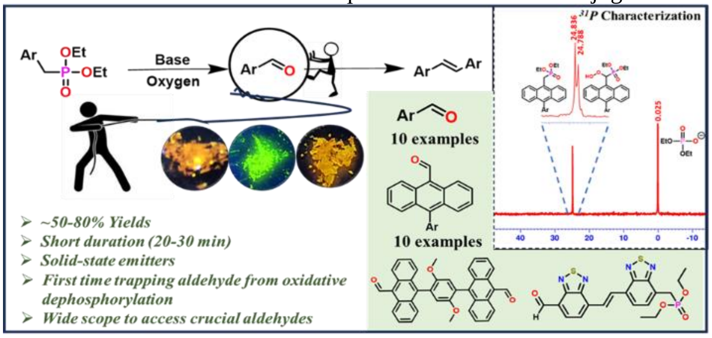
PL-45

Phosphonate to Aldehyde Conversion using Molecular Oxygen: An Intermediate Trapping Approach to Access Vital Fluorophores

Shivani Tripathi and **Manab Chakravarty***
Department of Chemistry, BITS-Pilani Hyderabad Campus, Hyderabad-500078, INDIA
E-mail: manab@hyderabad.bits-pilani.ac.in

Abstract

Suitable phosphonates are primarily utilized in olefination reactions via Horner-Wadsworth-Emmons (HWE) reaction with aldehyde to access wide range of alkenes.[1] Even though the phosphonate carbanion majorly generates the alkenes, molecular oxygen can react with the carbanion to form aldehydes.[2] Recently, we and others found that oxidative dephosphorylation reactions mostly generate symmetrically substituted alkenes from organophosphonates.[3] Even the ubiquitous presence of oxygen can produce such alkenes as a side product in small amounts from Wittig/ HWE reactions. So far, aldehydes have been anticipated to be the on-pathway intermediate since their detection, but there was no substantial experimental evidence to support this. Herein, aldehyde intermediates are judiciously trapped before forming alkene on dephosphorylation reactions of diverse phosphonates. Consequently, a unique synthetic strategy has been recognized to access structurally diverse aldehydes by oxidizing phosphonate carbanions using molecular oxygen. Hence, it is the first time to trap and isolate aldehydes since the historical discovery of Wittig/ HWE reactions. Only ketone/amide was separated as a support, but no aldehyde. The optimization studies offer 48-84% reaction yields of such aldehydes. The mechanistic studies are validated with reaction mixture 1H and 31P-NMR studies. Along with other various aldehydes, a unique class of structurally diverse anthracenyl aldehydes exhibiting intense fluorescence has been identified. The extended process to bis-phosphonates led to bis-carboxaldehyde forming in 52-68% yield within 30 min. The scope is further extended to achieve 2,1,3-benzothiadiazole-linked phosphonate, functionalized with carboxaldehyde. Many of these aldehydes are found to be excellently emissive in the solid state and would be excellent precursor to access π-conjugates of various interests.



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Personal Profile

Prof. Manab Chakravarty completed his Master of Science with a specialization in Inorganic Chemistry from Visva-Bharati University. After a short exposure at the Department of Atomic Energy Facilities-Kolkata, Prof. Chakravarty joined for Doctor of Philosophy on phosphonate chemistry at the School of Chemistry, University of Hyderabad, and completed in 2007. He had six months of industrial experience working with the chemical industry in Chembiotek, Kolkata. He was a Department of Atomic Energy postdoctoral fellow at the Department of Chemistry, University of New Mexico, USA, with Prof. Robert T. Paine in designing phosphonate ligands for selective extraction of radioactive elements. In 2010, he joined as an Assistant Professor at the BITS-Pilani-Hyderabad campus and commenced his independent research career. Currently, he is working as a professor. His research focuses on the designing and synthesis of new organophosphonates for the synthesis of extensive π-conjugates. His work was recognized in Indian Science Wire news (Latest S &T news from India). He was conferred with ACS best presentation award and selected in CCAMP-NC-TRAC 2023. He is looking for solid-state emitters as stimuli-responsive materials for optical recording and sensors. He is currently concentrating on developing fluorophores that detect spoiled/or decayed protein-rich food items at different stages.

Prof. Manab Chakravarty,
BITS-Pilani, Hyderabad Campus
E-mail: manab@hyderabad.bits-pilani.ac.in

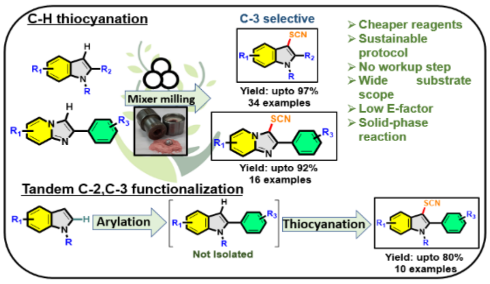
PL-46

Solid-phase Mechanochemical Tandem C-H Activation

Mainak Banerjee*
Department of Chemistry, BITS, Pilani- K. K. Birla Goa Campus, NH 17B, Bye Pass Road, Zuarinagar,
403726, Goa, INDIA
E-mail: mainak@goa.bits-pilani.ac.in

Abstract

Mechanochemistry is one of the IUPAC-recognized sustainable technologies due to its greener attributes like solvent-free approach, high-atom economy, and time and energy efficiency. Mechanochemistry has been explored in various organic reactions, inorganic materials, pharmaceutical chemistry, synthesis of dyes, and so on [1]. Like a large variety of solvents is used for conventional media, mechanochemistry can be conducted in solid matrices in silica, alumina, common salts and for liquid-assisted grinding (LAG) PEG, IL can be used to avoid use of organic solvents during the reaction. Mechanochemical transformations follow faster kinetics and often exhibit unique features like stereo-, regio-, chemo-selectivity, opportunity for tandem-reactions etc., which is often unprecedented in conventional solution-phase. Mechanochemistry has recently shown its prominence in the thriving area of C-H bond activation [2]. In our lab, we explored various mechanochemical organosynthesis including a) metal-catalyzed C-H bond activation of heterocycles [3], b) various cyclocondensation reactions, c) synthesis of dyes and fluorophores, etc. Solid-phase reactions were found suitable for tandem reactions. The talk will mostly focus on mechanochemical C-H and how a solid matrix can be useful for tandem mechanochemistry.



Scheme 1. A representative mechanochemical tandem C-H activation.[2c]

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Personal Profile

Professor Mainak Banerjee obtained his Ph.D. in 2006 from Jadavpur University and carried out his PhD work at IICB, Kolkata under the guidance of Dr. Asish K. Banerjee. After two postdoctoral studies at Pusan National University (2006-2007), and POSTECH (2007-2009) in Republic of Korea, he joined Department of Chemistry at BITS Pilani KK Birla Goa Campus as an Assistant Professor and started his independent career. He became a Full Professor in 2021 and continued his journey at the same institute.His current research interests are Green Chemistry, Mechanochemistry, Microwave Synthesis, C-H bond activation, Chemosensors etc. He has over 85 publications to his credit and 3 patents.

Awards

Elected as a member of Royal Society of Chemistry (MRSC)
Recipient of BK 21 fellowship of Korea Government for Postdoctoral studies.
Research Excellence Award (2024) in Basic Research by BITS Pilani KK Birla Goa Campus

Mainak Banerjee
Department of Chemistry, BITS, Pilani- K. K. Birla Goa Campus, NH 17B, Bye Pass Road, Zuarinagar, 403726, Goa, INDIA
E-mail: mainak@goa.bits-pilani.ac.in

PL-47

N-Heterocyclic Carbene (NHC) Supported Metal Complexes: Understanding of Structure-Activity Correlation

Arnab Rit
Department of Chemistry, Indian Institute of Technology Madras, Chennai - 600036, INDIA
E-mail: arnabrit@iitm.ac.in

Abstract

Ancillary ligands are known to play crucial roles in the activity of any metal complexes and their stereoelectronic parameters are normally considered as important factors to modulate their properties thus, essentially their reactivity.Over the past few decades, N-Heterocyclic carbene (NHC) ligands have established themselves as an elite class of ligands in various fields such as organometallic chemistry, homogeneous catalysis, material chemistry,metallopharmaceuticals.[1] In this context, detailed understanding of the combined steric and electronic influence of the ancillary NHC ligands towards structural diversity in metal complexes and their activity in catalytic transformations would provide important information for the development of future efficient catalyst systems.[2] To study such effects, we have synthesized a range of mono- and bimetallic complexes (Figure 1) and to understand the influence of ligand variations, all these complexes were tested in different catalytic transformations which uncovered that substantial tailoring of activity is indeed possible via subtle alteration of their stereoelectronic profiles.[3] Further, structural chemistry involving these NHC ligand systems will also discussed.

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Personal Profile

Dr. Arnab Rit, after graduating from IIT Kharagpur in 2007, has earned his doctorate degree in Organometallic Chemistry with distinction “summa cum laude” from WWU Muenster, Germany in 2011. After that he was a post-doctoral researcher at RWTH Aachen, Germany followed by prestigious Marie-Curie post-doctoral fellow at the University of Oxford, UK. In December 2015 , he returned back to India and joined IIT Madras as an Assistant Professor and later promoted to Associate Professor. Dr. Arnab is specialized in the field of organometallic and main group chemistry. His research interest mainly focuses on the development of main group and transition metal-based complexes of N-heterocyclic carbene (NHC) ligands as efficient catalysts for diverse, especially green, chemical transformations. He has published more than >40 highimpact journal publications, as an independent researcher from IIT Madras and a book chapter in RSC book “SPR Organometallic Chemistry”.

Awards:

Among his distinctions are the Young Scientist Award by The Academy of Sciences - Chennai, CRS Bronze Medal 2024, Institute Research and Development Award (Early Career Award) from IIT Madras, SERB Early career research award, DST-INSPIRE faculty fellowship, Marie Curie postdoctoral Fellowship (from the European Union) at the University of Oxford

Dr. Arnab Rit
Indian Institute of Technology Madras,
Chennai - 600036, INDIA
E-mail: arnabrit@iitm.ac.in

PL-48

Chromo-fluorogenic sensors for chemical warfare agents in real-time analysis: A unique non-invasive chemodosimetric approach

Ajit Kumar Mahapatra*, Anirban Karak, Pintu Ghosh, and Dipanjan Banik
Department of Chemistry, Indian Institute of Engineering Science and Technology, Shibpur, Howrah
E-mail: akmahapatra@chem.iiests.ac.in

Abstract

Fluorescent chemodosimeters have emerged as attractive protocols for the sensing of a large number of different analyte species in diverse media and the benefits of this approach are many. It is non-destructive, easy and highly portable while at the same time selective and sensitive. Chemical warfare agents (CWAs) are among the most prominent threats to the human population, our peace, and social stability. Therefore, their detection and quantification are of utmost importance to ensure the security and protection of mankind. Nerve agents which disrupt the biochemical pathway by which nerve cells communicate have caused mankind great pain through both inadvertent and intentional exposure. So, development of fast, non-invasive fluorescent dosimeters for the sensing of these important analyses is the need of the hour. Analytical methods that can accurately detect CWAs are essential to global security measures and for forensic analysis. Small molecule fluorescent probes have emerged as attractive chemical tools for CWAs detection, due to their simplicity, ease of use of strip-based, excellent selectivity, and high sensitivity, as well as their ability to be translated into handheld devices. In this presentation, we provide an overview of CWAs and some reported fluorescent probes that have been designed for the detection of CWAs in our laboratory.[1-6] The designed criteria and mechanism for CWAs detection, change in optical output, and application for each fluorescent probe for live-cell imaging are also highlighted

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Personal Profile

Professor Mahapatra graduated in chemistry in 1991 from Midnapore College and followed it up with a master's degree in 1994 from the IIT, Kharagpur. He is enrolling in his doctoral studies under the guidance of Prof. Shyamaprosad Goswami at the IIT, Kharagpur as a CSIR fellow. Eventually, his mentor Prof. Goswami transferred from IIT KGP to B. E. College (D.U.) in 1999 and hence he was awarded a Ph.D. degree in February 2001 from BESU. Meanwhile, in April 1998 he was appointed lecturer (WBES) at Jhargram Raj College, Department of Chemistry (UG & PG), where I taught until my appointment in June 2008 as Associate Professor at IIEST, Shibpur (at that time BESU, Shibpur) and was promoted to full Professor in April 2013. Prof. Mahapatra is reported to have done extensive research on the toxic analyte sensing cation, anion, cardiovascular agents, and biothiols sensing. He has developed several chemodosimeter for Chemical Warfare Agents (CWAs) sensing. His research has been documented by way of a number of peer-reviewed articles; Research Gate, an online article repository of scientific articles, has listed 125 of them respectively. He has mentored 24 scholars in their doctoral and post-doctoral studies and has been involved in several projects for agencies such as CSIR, DST-SERB, DST(WB), DBT, BRNS, and UGC. He now currently serving as a HAG Professor from August 2021 and former Head, (i) Department of Chemistry, (ii) School of Community Science and Technology, and Centre for Health Care Science and Technology, IIEST, Shibpur.

Prof. Ajit Kumar Mahapatra
Department of Chemistry, Indian Institute of Engineering Science and Technology, Shibpur, Howrah
E-mail: akmahapatra@chem.iiests.ac.in

PL-49

Pb(II) removal from its aqueous solution using raw and fermented nut shells

Abhishek Das and **Sudip Kumar Das**
Chemical Engineering Department
University of Calcutta
92 APC Road, Kolkata – 700009, India
E-mail: drsudipkdas@gmail.com; skdchemengg@caluniv.ac.in

Abstract

The present study opens a new door to modify any green adsorbents via an utterly biological process called solid-state fermentation. The different kinds of enzymatic activity during fermentation change the raw green adsorbent's surface texture and functional groups. This report also compares the adsorption capacity of Pb(II) ions from aqueous solution onto three green adsorbents namely, Groundnut shell (GS), Walnut shell (WS) and Almond shell (AS) with their modified form, Fermented Groundnut shell (FGS), Fermented Walnut shell (FWS) and Fermented Almond shell (FAS). This fabrication of nut shells was done via solid-state fermentation (SSF) using an isolated *Aspergillus* strain and that significantly improved the adsorption capacity. During the 30-day solid-state fermentation (SSF) process, we collected samples six times on different days. The adsorptive capacity and enzyme activity varied among the six samples. After analyzing the results, it was decided to focus on the sample collected on the 20th day due to its higher adsorptive capacity than the others. It has been proven that only a premium dose of enzymatic activity can increase the adsorptive capacity, not lower or even vigorous enzymatic activity. FTIR study confirmed changes in the functional groups during and before adsorption onto all the adsorbents. BET analysis showed that the fermented nut shells have a larger surface area than raw nut shells. SEM analysis revealed that all three fermented adsorbents have a rough surface suitable for adsorption. During SSF treatment, released enzymes like laccase and amylase may have played an essential role in changing texture, surface area, functional group, and adsorption capacity. Finally, it was observed that the fermented shells have superior Pb(II) removal efficiency compared to any of the studied raw shells. This study introduces a new method to modify natural cellulosic adsorbents without using any chemical substances, providing an advantage over traditional modification techniques.

Personal Profile

Dr Sudip Kumar Das is currently Retd. Professor and Former Head of the Department of Chemical Engineering, University of Calcutta. He has completed his PhD and M. Tech. in Chemical Engineering from the Indian Institute of Technology, Kharagpur and graduated with a B. Tech. in Chemical Engineering and B. Sc. (Hons) in Chemistry from the University of Calcutta. He is actively engaged in research related to different fields of Chemical Engineering, like single and multiphase (gas-liquid) flow through pipelines and piping components, multiphase flow through coils, fluidization and inverse fluidization, wastewater treatment technology, Biosorption of heavy metals, heavy metals and organic pollutants removal from wastewater, Process Plant Safety, Computational fluid dynamics, artificial neural networks and machinable glass-ceramics. He published more than 225 papers in the abovementioned fields in National/International Journals, presented more than 300 papers at National/International Conferences, and delivered more than 150 invited lectures at National/International Conferences. He acts as a reviewer for more than 225 National and International journals. Guided 20 PhD students, and 12 students are doing PhD, 35 M. Tech. Students. Member of professional societies like IEEE, Indian Institute of Chemical Engineers, Indian Association for Air Pollution Control, Indian Chemical Society, Millennium Institute of Energy and Environment Management, International Congress of Chemistry and Environment, BIS. His paper was cited in Perry's Handbook & and almost all non-Newtonian Fluid books.
Citation received: 8055
h-index: 43
i10-index:104

Sudip Kumar Das
Chemical Engineering Department
University of Calcutta
92 APC Road, Kolkata – 700009, India
E-mail: drsudipkdas@gmail.com;
skdchemengg@caluniv.ac.in

PL-50

Methanolic Extract of *Acorus calamus* Rhizome Loaded Nanostructured Lipid Carriers: Preparation, Physicochemical Properties and *In Vivo* Anti-allergic Activity Studies

Sahadeb Panja,[1] Subhadip Mandal,[1] Maitreyee Mitra,[1] Tanusree Biswas,[1] Tithi Mondal,[1] Debarati Jana,[2]
Chandradipa Ghosh,[2] Biplab Roy,[3] Anuttam Patra[3] and **Amiya Kumar Panda**[1,4,*]
[1]Department of Chemistry, Vidyasagar University, Midnapore 721102, INDIA
[2]Department of Human Physiology, Vidyasagar University, Midnapore 721102, INDIA
[3]Luleå University of Technology, SE-97187 LULEÅ, SWEDEN
[4]Rani Rashmoni Green University, Hooghly-712410, INDIA
E-mail: akpanda@mail.vidyasagar.ac.in

Abstract

Allergic reactions are increasing globally, necessitating the development of effective and safe therapeutic approaches. In this study, we investigated the potential of Nanostructured lipid carriers (NLCs) loaded with methanolic extract of *Acorus calamus* rhizome (ACE) as a novel strategy for the treatment of allergic reactions. NLC formulations were prepared using stearic acid, tripalmitin, soya lecithin (1:2:2; M/M/M) by cold homogenization and ultrasonic dispersion technique and where polyvinyl alcohol (PVA), polyethylene glycol (PEG), Tween-60 (T-60), poloxamer-188 (P188), were separately used as stabilizers. The ACE, known for its anti-inflammatory and anti-allergic properties, was incorporated into the NLCs to improve its bioavailability and therapeutic efficacy. Combined Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), X-ray photoelectron spectroscopic (XPS), dynamic light scattering (DLS), atomic force microscopy (AFM), scanning electron microscopy (SEM), transmission electron microscopy (TEM), differential scanning calorimetry (DSC), UV–vis absorption spectroscopy and method of dialysis were adopted in characterizing the both bare and ACE loaded NLC formulations. Comparative studies on different formulations were assessed, among all formulations poloxamer-188 stabilized NLC was smaller than other stabilizers. AFM, SEM and TEM images revealed the spherical and smooth surface morphology of NLCs. The encapsulation efficiency and drug payload were higher for poloxamer-188 stabilizer. In-vitro release profile of systems exhibited sustained release and followed Krosmeyer-Peppas model. The formulations were non-cytotoxic to human blood lymphocytes, as demonstrated by the MTT assay. In vivo anti-allergic activity of ACE loaded NLC formulations were evaluated in a BALB/c mice model of black tiger prawn extract (BTP) induced allergic rhinitis. All ACE loaded NLCs significantly reduced Th2 cytokine levels in the blood serum and inflammatory cell infiltration in the gut mucosa compared to the free ACE.

Personal Profile

Professor Amiya Kumar Panda obtained his Ph.D. in 1998 from Tripura University, Agartala, Tripura, India under the guidance of Professor Ajit Kumar Chakraborty. After postdoctoral studies with Professor Satya Priya Moulik at Jadavpur University (1997-1998), he started his independent career as an Assistant Professor, Behala College, under University of Calcutta (1998-2007), followed by serving as Associate Professor and Professor in Chemistry in University of North Bengal (2007-2015). He then moved to Vidyasagar University in 2015. Afterwards, he served as the founder Vice-Chancellor of Sadhu Ram Chand Murmu University of Jhargam for a period of two years during 2021-2023. Presently Prof. Panda is the Vice-Chancellor of Rani Rashmoni Green University since December 2024.

Awards

I. BOYSCAST Fellowship, Department of Science and Technology, Govt. of India,2000
II. Indian Science Congress Association Young Scientist Award, 2001
III. Visiting Scientist: Ian Wark Research Institute, University of South Australia, 2006.
IV. Endeavour Award – 2007, Govt. of Australia.
V. Best Teacher Award Chemical Research Society of India-2012
VI. DST-JSPS short term visiting fellowship 2014.
VII. Bronze Medal 2015, Chemical Research Society of India.
VIII. Endeavour Ambassador Award, 2017, Govt. of Australia
IX. Hyogo Overseas Research Network Fellowship, Govt. of Hyogo, to work in the University of Hyogo, Japan. **Publications: 114, Ph.D. students awarded: 17**

Prof. Amiya Kumar Panda
Department of Chemistry, Vidyasagar University,
Midnapore 721102, INDIA

PL-51

Development of Cross Dehydrogenative Coupling Reactions

Frederic W. Patureau
Institute of Organic Chemistry, RWTH Aachen University, GERMANY
E-mail: frederic.patureau@rwth-aachen.de

Abstract

Many C-H bond functionalizations today rely on poorly atom and step efficient oxidants, leading to significant and costly chemical waste, thereby seriously undermining the overall sustainability of those methods. As restrictions in sustainability regulations will further increase, and the cost of certain chemical commodities will rise, atom efficiency in organic synthesis remains a top priority for research. A main objective of our group is to develop novel technologies utilizing O_2 and other sustainable oxidants in order to allow useful and challenging dehydrogenative C─N[a] and N─N[b] bond forming coupling reactions.

References:

(a) M.-L. Louillat, F. W. Patureau, Chem. Soc. Rev. 2014, 43, 901; (b) A. Tabey, P. Y. Vemuri, F. W. Patureau, Chem. Sci. 2021, 12, 14343.

Personal Profile

Professor Frederic W. Patureau obtained his Ph.D. in 2009 from the University of Amsterdam (UvA, Netherlands) under the guidance of Prof. Dr. Joost N. H. Reek. After postdoctoral studies with Prof. Dr. Frank Glorius at the WWU Münster (2009-2011), he started his independent career as a junior professor at the TU Kaiserslautern. In 2018, he became Synthetic Organic Chemistry Professor at the RWTH Aachen University, Germany.

Awards
Alexander von Humboldt Fellowship
JSP fellowship of the Bürgenstock Conference
Dr. Otto Röhm Memorial Fellowship
Thieme Chemistry Journal Award
ERC Starting Grant

Prof. Frederic W. Patureau
RWTH Aachen University,
Germany
E-mail: frederic.patureau@rwth-aachen.de

PL-52

Selectivity-Driven Sustainability by Using Single Atom Photocatalysts

Prof. Shoubhik Das*
Department of Chemistry, University of Bayreuth, Bayreuth, Germany
e-mail: shoubhik.das@uni-bayreuth.de

Abstract

Recently solar energy has exhibited great potential as a promising alternative to substituting the traditional energy sources because it is renewable, abundant, affordable, and everlasting. Among various solar energy conversion techniques, photocatalysis is deemed as a promising, environmentally benign, and cost-effective strategy to generate both fuels and high-value chemicals. While in this domain homogeneous photocatalysts prevail due to higher selectivity but the reutilisation of the catalyst is next to impossible. On the other hand, heterogeneous photocatalysts are recyclable but not highly selective. Therefore, to make a bridge between these two, a new strategy has been developed by synthesizing single metal atom photocatalysts that are selective as well as recyclable. In general, single-atom photocatalysts (SAPs) have shown their compelling potential and arguably become the most active research direction in photocatalysis due to their fascinating strengths in enhancing light-harvesting, charge transfer dynamics, and surface reactions of a photocatalytic system. SAPs could attract such huge attention mainly attributed to the following compelling advantages as compared with their nanocluster, nanoparticle, and bulk counterparts: (i) exclusively high activity and selectivity brought by their unsaturated coordination sites and unique electronic structures, (ii) significant reduction in catalytic metal usage endowed by the maximum atom-utilization efficiency, (iii) easy identification of the reaction mechanisms attributed to well-defined single-atoms as active sites, and (iv) a good platform for understanding structure–activity relationships ascribed to their atomic scale structure. Based on this, recently we have developed several photocatalytic strategies for the synthesis of fuels as well as high valued chemicals via C-H bond functionalization, CO2 utilisation, water oxidation, plastic valorisation etc. where the catalysts exhibited excellent selectivity as well as recyclability.

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Personal Profile

Prof. Shoubhik Das obtained his PhD under the guidance of Professor Matthias Beller in 2012 at Leibniz Institut of Catalysis (LIKAT), Germany and followed by this, he did postdoctoral research with Professor Matthew Gaunt at the University of Cambridge, UK and with Prof. Paul Dyson at the EPFL in Switzerland. He started his independent research career (habilitation) in the University of Göttingen, Germany in 2015 and after four years, he moved to the University of Antwerp as a tenure track professor. Since August 2023, he is a chair professor at the Department of Organic chemistry at the University of Bayreuth, Germany. His current research interests are the development of homogeneous and heterogeneous photo-/electrocatalysts and their applications into organic synthesis as well as fuel type molecules.

Prof. Shoubhik Das,
University of Bayreuth,
Bayreuth, Germany

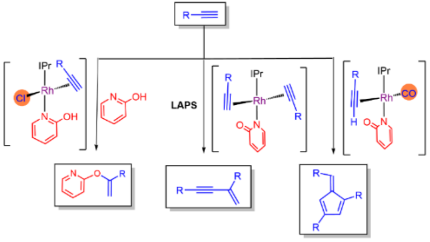
PL-53

Ligand-Controlled Interrupted Alkyne Dimerization within Rh-NHC Architectures

Belinda Español-Sánchez, María Galiana-Cameo, **Ricardo Castarlenas***
Instituto de Síntesis Química y Catálisis Homogénea (ISQCH)-Departamento de Química Inorgánica, CSIC-Universidad de Zaragoza, C/Pedro Cerbuna, 12, 50009 Zaragoza, Spain
e-mail: rcastar@unizar.es

Abstract

The concept of Metal-Ligand Cooperation (MLC) has emerged as an essential piece in organometallic-mediated bond cleavage and formation. The synergistic effect arising from MLC generally triggers an enhancement of catalytic activity and provides a better control of selectivity. In other way, alkynes are valuable starting materials for a myriad of organic transformations, however it is challenging to control their chemo- regio- and stereoselectivity.[1] In this context, we have disclosed that Rh-NHC complexes bearing a 1,3-bis-heteroatomic-acidato (BHetA) ligand efficiently catalyze the specific dimerization of terminal alkynes towards Markonikov-type head to tail enynes.[2] The proposed mechanism involves a cooperative Ligand Assisted Proton Shuttle (LAPS) process, in which a ligand acts as a transporter of a proton from one substrate to another, coupled with fast reductive elimination of the newly generated metal-organic fragments. Interestingly, tuning the ancillary ligands within Rh-NHC architectures resulted in the interruption of alkyne dimerization to generate new catalytic pathways that give access to the formation of valuable organic entities such as o-alkenyl-pyridones or fulvenes. Herein, we will present the relevant factors that governs alkyne chemoselectivity.



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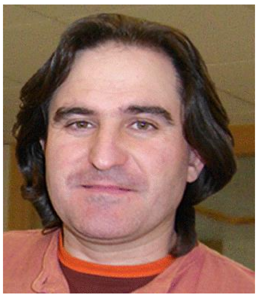
Personal Profile

Dr. Ricardo Castarlenas obtained his Ph.D. in 2001 from the University of Zaragoza under the guidance of Prof. Miguel A. Esteruelas working in the stoichiometric imination of alkynes with Osmium complexes. After postdoctoral studies with Prof. Pierre H. Dixneuf in the University of Rennes-1 (2001-2004), studying the olefin metathesis activity of Ruthenium-arene catalysts, he returns to University of Zaragoza (2004-2007) as associate researcher working in catalytic application of Osmium derivatives. Later, he become "Ramon y Cajal" researcher (2007-2012) and ARAID foundation senior research fellow (2012-2015). In 2016 he obtains a CSIC permanent research position in the ISQCH to develop Rhodium-NHC catalytic transformations. He was visiting Professor at the University of L'Aquila in Italy (2015).



Dr. Ricardo Castarlenas,
ISQCH-University of Zaragoza, Spain
e-mail: rcastar@unizar.es

PL-54 PAC Award Lecture

Strategies for Synthesis of Eribulin Related Substances: A Stereochemical Insight

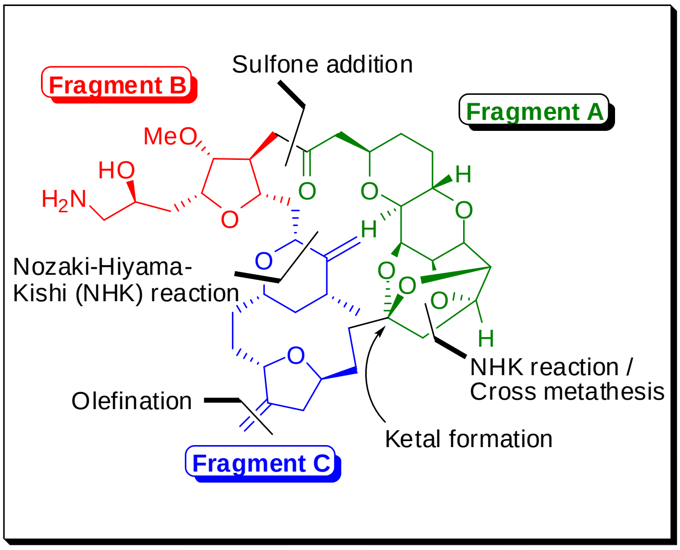
Rakeshwar Bandichhor
API-R&D
IPDO, Dr. Reddy's Laboratories Ltd., Bachupally, Hyderabad, Telangana – 500090, India
(E-mail: rakeshwarb@drreddys.com)

Abstract

Eribulin was approved in 2000 for the treatment of metastatic breast cancer patients who were primarily received at least two chemotherapeutic regimens. Eribulin consists of three tetrahydrofurans and three tetrahydropyrans, representing a macrocyclic ketone analog of the marine sponge natural product halichondrin B. Eribulin binds predominantly microtubules, thus resulting in inhibition of microtubule dynamics unlike to those of vinblastine and paclitaxel. It works by onsetting apoptosis of cancer cells following prolonged and irreversible mitotic blockade.

Despite of significant structural simplification attempts through medicinal chemistry approaches to halichondrin, Eribulin still possesses massive challenge by virtue of setting up 19 chiral centres and leaving behind other myriads of isomers in the process of synthesizing it. Strategies for synthesis of Eribulin related substances will be discussed.

Figure 1. Structure and Reterosynthetic Fragments of Eribulin



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Personal Profile

Dr. Rakeshwar Bandichhor is a chemistry leader with 24+ years of experience in the R&D at academic and pharmaceutical industry set up with extensive knowledge and experience in various drug development processes, served in company strategic committees and instrumental in commercialization.

Played key role in delivering several generics in an accelerated manner to the market

2010: Anveshan Award 2010, Innovation Plaza, IPDO, Dr. Reddy's Laboratories, Hyderabad

2010: Chairman Excellence Award, (in the category of Individual Functional Excellence), Dr. Reddy's Laboratories Hyderabad.

Dr. Rakeshwar Bandichhor,
Dr. Reddy`s Laboratories Private Ltd, India
E-mail: rakeshwarb@drreddys.com

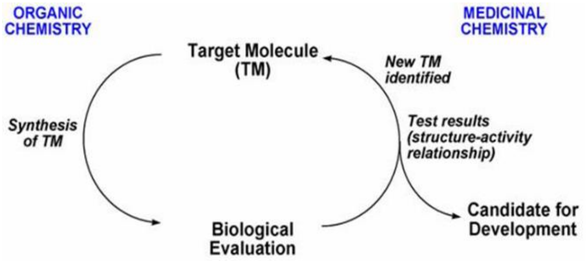
PL-55

Expanding Discovery Chemistry Toolbox: From Concept to Practice

Parthasarathi Das
Department of Chemistry and Chemical Biology
Indian Institute of Technology (ISM) Dhanbad
Dhanbad-826004, INDIA
Email: partha@iitism.ac.in

Abstract

The pharmaceutical industry remains solely reliant on synthetic methodology to prepare drugs or drug like molecules for their discovery/process program. The expansion of synthetic methodology in recent years has greatly facilitated the preparation of molecules that would once have been considered an insurmountable synthetic challenge. In turn, the pharmaceutical industry, where large numbers of molecules are prepared and tested for their therapeutic use became the principal end-users and beneficiaries of this enlarged toolkit. Designing and discussing of Transition-Metal promoted various synthetic tools for the synthesis of pharmaceutically important heterocycles and generation of new chemotypes with translational potential will form the basic premise of my presentation.[1]



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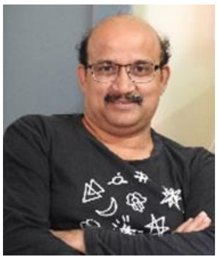
Personal Profile

Dr. Parthasarathi Das received his Ph D degree from CSIR-National Chemical laboratory, Pune, India in 1999 (Prof. Ganesh Pandey). He did postdoctoral studies (1999-2003) at the RWTH-Aachen, Germany (Prof. H-J. Gais), Tohoku University, Japan (Prof. M. Hirama) and Harvard University, USA (Prof. Y. Kishi). In 2003 he moved to India to join Discovery Research of Dr. Reddy's Laboratories Ltd., Hyderabad and worked in medicinal chemistry group having research focus on various therapeutic areas e.g., oncology, metabolic disorder and antibacterial. After completing ten years in Industry, in 2012 he moved to academia and joined CSIR-Indian Institute of Integrative Medicine, Jammu. In 2018 he moved to Indian Institute of Technology (ISM) Dhanbad and joined as faculty in the Department of Chemistry and Chemical Biology. His current research interests include medicinal chemistry, development of new synthetic tool, synthesis of biologically active natural products and Drug impurities. He has been selected for Chemical Research Society of India (CRSI) Bronze Medal, 2019 for his contribution to research in chemistry. He serves as an International Advisory Board Member of New Journal of Chemistry (NJC) from RSC Publishing Home. He is Fellow of the Royal Society of Chemistry (FRSC) and at present he is the Head of Department of Chemistry and Chemical Biology, IIT (ISM) Dhanbad.



Dr. Parthasarathi Das
Department of Chemistry and Chemical Biology
Indian Institute of Technology (ISM) Dhanbad
Dhanbad 826004, INDIA
E-mail: partha@iitism.ac.in

PL-56

Electrochemistry-Driven Organic Synthesis

Goutam Brahmachari*
Department of Chemistry, Visva-Bharati (a Central University), Siksha-Bhavana (Institute of Science),
Santiniketan-731235, West Bengal, INDIA
E-mail: brahmg2001@yahoo.co.in; goutam.brahmachari@visva-bharati.ac.in

Abstract

In recent times, organic electrosynthesis has become influential in modern synthetic chemistry and finds practical applications in academia and industry due to low energy consumption, mildness, and environmental friendliness. Organic electrochemistry has led to a boom in new synthetic methodologies and their mechanistic understandings. Electrosynthesis has already led to several unprecedented methods. Much of the promise of such a technique hinges on their ability to achieve unique bond constructions that are not feasible using established protocols. Thus, synthetic chemists have been motivated to exploit electrosynthesis to develop efficient strategies for potential organic small molecules. Still, this spectacular field of research is growing in the scenario of global chemical research. As part of our ongoing research endeavours, we have also been deeply involved in green chemistry research during the last few years, focusing on designing and developing new approaches for biologically promising organic small molecules, including the exploration of electrochemical strategies in implementing a handful of organic transformations of interest.

As part of our ongoing research endeavours, we have also been deeply involved in green chemistry research during the last few years, focusing on designing and developing new approaches for biologically promising organic small molecules, including the exploration of electrochemical strategies in implementing organic transformations of interest. In recent years, our group has already published a handful of such research articles in the frontline international journals of repute. The developed electrochemical strategies yielded several series of biorelevant organic molecules, particularly heterocyclic compounds, based on C-H functionalization. A few of our selected synthetic drives in the domain of electrosynthesis in accessing functionalized organic small molecules of biological promise will be presented in the meeting.

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Personal Profile

Professor Goutam Brahmachari, *Ph.D., D.Sc., FRSC,* presently holding the position of a full professor (since 2011) of organic chemistry at Visva-Bharati University (India), has been deeply involved in research activities that include synthetic organic chemistry, green chemistry, medicinal and natural products chemistry. With about 26 years of experience in teaching and research, he has so far produced 280 scientific publications, including original research papers (162), review articles (35), books (28), and invited book chapters (55) in synthetic organic chemistry and natural products chemistry. He has supervised 20 doctoral students (PhD programme) so far.

Prof. Brahmachari received several awards and accolades, including the CRSI Bronze Medal-2021, Dr. Basudev Banerjee Memorial Award-2021, and INSA Teachers Award-2019, for his teaching and research contributions. Prof. Brahmachari was featured in the World Ranking of the Top 2% Scientists (Organic Chemistry Category) in 2020-23 (both in whole career and single years), in the AD Scientific World Ranking of Scientists -2022-2024, as the ScholarGPS Highly Ranked Scholar-2022 (Lifetime, securing a position in the top 0.05% of all scholars worldwide).

Prof. Goutam Brahmachari
Department of Chemistry, Visva-Bharati (a Central University), Siksha-Bhavana (Institute of Science), Santiniketan 731235, West Bengal, India.
E-mail:brahmg2001@yahoo.co.in;
goutam.brahmachari@visva-bharati.ac.in

PL-57

Development of a new class of self-aggregative *bis*-arylidene Oxindole as broad-spectrum breast cancer and colorectal cancer-selective therapeutics

Susanta Sekhar Adhikari
Department of Chemistry, University of Calcutta, Kolkata 700009
E-mail: adhikarisusanta@yahoo.com/ssachem@caluniv.ac.in

Abstract

Oxindoles, as previously studied are used as potent anticancer agent having many relevant biological properties and this class of molecule has contributed immensely in the field of medicinal chemistry. The most important feature of oxindole is that it can be modified into various novel structures which are not only be used as anticancer agents but also can be used as antifungal, antimicrobial agents as well as for treating neurodegenerative diseases. Bis-arylidene oxindoles[1] (OXIs) are estrogen receptor (ER)-selective bioactive molecules with moderate potency. In here, we have designed, synthesized and evaluated a series of twin aliphatic chain cationic lipid-conjugated bis-arylidene oxindole molecules with variations in nature of linker, lengths of carbon spacer and hydrophobic twin chains. We observed that among the various structural analogues, C8 twin-chain containing molecules showed effective cancer cell-selective cytotoxicity in different cancer cell lines. These molecules selectively induced apoptosis, ROS production and cell cycle inhibition at G1/S phase in ER+ breast cancer cells but not in non-cancer cells. Additionally, these molecules formed homogenous self-assemblies exhibiting effective hydrodynamic diameter with positive surface charge. The self-assemblies also showed prominent cancer cell-selective uptake and DNA-binding abilities. We have shown successful incorporation of dexamethasone to the self-assemblies, and its enhanced cytotoxicity even in ER-negative breast cancer cells. Results indicate that some molecules, albeit their potent and selective ER-positive anti-breast cancer activity, can be repurposed as targeted delivery systems and hold promise as unique, broader spectrum breast cancer cell-selective therapeutic payloads.[2] In another approach, we have designed a new analogue of bis-arylidene oxindole, called ACPOXF exhibiting structural resemblance with tamoxifen, an ER antagonist. ACPOXF, as like Oxifen (OXF), also exhibits anticancer property against ER+ breast cancer cells. But, importantly, ACPOXF could self-aggregate in aqueous solution without the help of any co-lipid. The nano-sized aggregate could carry extraneous drugs within itself. ACPOXF self-aggregate upon co-formulation with glucocorticoid receptor (GR) synthetic ligand, dexamethasone (Dex) (called, ACPOXF-Dex aggregate) could kill even ER-negative [ER (-)] colorectal cancer cells and increased survivability of colon-tumor bearing mice.[3] In conclusion, a typical structural modification in ER-targeting Oxifen moiety resulted in its self-aggregation that enabled to carry a GR-ligand, thus broadening its selective antitumor property especially as colon cancer therapeutics.

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Personal Profile

Professor Susanta Sekhar Adhikari did his Master's study in 1994 from Indian Institute of Technology, Kharagpur. He obtained his Ph.D. in 2000 from National Chemical Laboratory (NCL), pune under the guidance of Dr Mukund k. Gurjar, former Dy. Director in NCL-Pune. After a 1st postdoctoral study with Professor Stephen Hanessian at Univ. of Montreal, Canada (2001-2003), he did his 2nd postdoctoral studies with Prof. Larry Overman at Univ. of Calfornia, Irvine (2003-2004). He started his independent research career in CSIR-Central Drug Research Institute, Lucknow (2006-2007) as a Scientist "C". Later on he joined as an Associate Professor in the Dept. of Chemistry, University of Burdwan (2008-2009) and then moved to the Department of Chemistry, University of Calcutta in 2010 and continued here as a professor-till date. He has already completed three (3) SERB-DST projects and one US sponsored project. He has published more than 55 in reputed International Journals. In addition to this, he has published six (6) US patents and one Indian patent to his credit. His research interests focused on Design and Development of Target Based New Chemical Entities for Breast-ovarian-colon Cancer and Malaria, Leishmania; Structure-based pharmaceutical drug design and synthesis; Development of novel synthetic procedures and its application towards synthesis of various bio-active compounds; Design and Development of fluorescent probes with nitrogen, oxygen and/or sulfur donor sites for detection of cancer, bio-analytes etc.

Prof. Susanta Sekhar Adhikari
Department of Chemistry, University of Calcutta, Kolkata 700009
E-mail: adhikarisusanta@yahoo.com/ssachem@caluniv.ac.in

PL-58

Revolutionizing Photocatalysis: High-Performance Monolithic Metal Oxide/Sulfide Structures for Rapid Degradation of Organic Contaminants

Surbhi Sharma and **Soumen Basu***
Affiliation: Department of Chemistry & Biochemistry, Thapar Institute of Engineering & Technology, Punjab, INDIA
E-mail: soumen.basu@thapar.edu

Abstract

Anthropogenic pollution severely impacts living organisms, with photocatalysis emerging as a promising method for water treatment. However, the use of powdered photocatalysts limits large-scale applications. Monolithic photocatalysts, with their superior transport kinetics and ease of recovery, address this issue. We have synthesized visible-light-driven monolithic photocatalysts (WO_3/SiO_2, Sb_2S_3/SiO_2, MoO_3/SiO_2, and CuO/SiO_2) via wet impregnation of metal salt precursors into silica monoliths. These monoliths exhibited high surface area, porous morphology, and favorable optical properties. Photocatalytic performance for degrading organic pollutants (dyes, pesticides, pharmaceuticals) was evaluated, with factors such as pH, catalyst concentration, light source, and illumination area studied. Trapping experiments revealed the degradation mechanism. Compared to powdered catalysts, the monolithic catalysts showed enhanced efficiency due to increased surface area, active sites, and light-harvesting ability, leading to faster reaction and transport kinetics.

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Personal Profile

Professor Soumen Basu earned his M.Sc. in Chemistry in 2003 and his Ph.D. in 2008 from IIT-Kharagpur under the mentorship of Professor T. Pal. Following his doctoral research, he pursued postdoctoral studies at the University of Alabama, USA (2008-2009) and at the Australian Institute for Bioengineering and Nanotechnology (AIBN), University of Queensland, Australia (2009-2011). Professor Basu began his academic career as an Assistant Professor at SGGSWU, Punjab, before moving to Thapar Institute of Engineering & Technology (TIET), Punjab, in 2014. He was promoted to Full Professor at TIET in 2022. His research focuses on environmental sustainability, including water splitting, wastewater treatment, and the degradation of toxic pollutants using advanced functionalized nanomaterials. Additionally, he is involved in the development of chemical sensors, nanobiosensors, and porous adsorbents for carbon capture and storage (CCS) technologies. With more than 200 published research articles in prestigious international journals, Professor Basu has an h-index of 61 and over 15,000 citations. He is ranked among the top 2% of scientists globally in the "World Ranking" for 2021, 2022, and 2023. Under his guidance, 18 Ph.D. students and 28 M.Sc. students have completed their degrees.

Soumen Basu
Thapar Institute of Engineering & Technology,
Punjab, INDIA
Email: soumen.basu@thapar.edu

PL-59

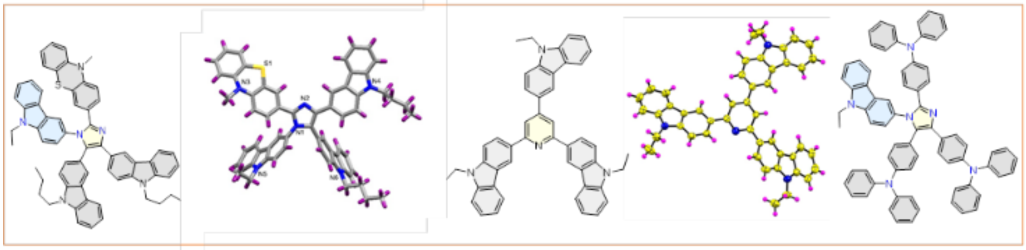
Organic Small Molecules for OLED Technology

Subrata Ghosh
School of Chemical Sciences
Indian Institute of Technology Mandi
Email: subrata@iitmandi.ac.in

Abstract

Looking at the past few decades of literature, the molecular and macromolecular systems have immensely contributed in the area of Organic Light Emitting Diode (OLED). In this regard, fascinating chemical scaffolds have been developed through rational designing over the years. Such chemical entities have been used efficiently in solid-state lighting technology. Since the fast report by Vanslyke and Tang in 1987, this technology has been probably one of the fastest growing ones.[1-2]

Given the tremendous industrial as well as academic importance, our group has been involved in designing and developing functional organic small molecules with varied chemical structures for OLED devices. We expanded our organic materials library for the emissive layer, hole transport layer and electron transport layer. In this presentation, I will majorly focus on our recent research outcomes on small molecule-based hole transport materials for OLED technology. The designs are primarily based on pyridine, imidazole and triarylamine cores with peripheral electron donating units (a few examples are shown below).[3-4] Such combinations resulted in the development of donor-acceptor systems with good hole transport properties. Given that OLED is a technology that deals with solid-state application, we investigated the molecular arrangements in solid state through the analysis of single crystal structures of some of the molecular systems. Moreover, detailed theoretical studies shaded light into several molecular properties. As an ultimate target, some of the developed molecular materials were explored for the fabrication of OLED devices.



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Personal Profile

Subrata Ghosh obtained his Ph.D. in 2006 from the Department of Chemistry, IIT Guwahati, under the guidance of Professor Abu T. Khan. After postdoctoral studies at Bar-Ilan University, Israel, Case Western University, US and University of Leipzig, Germany, he started his independent career as Assistant Professor at IIT Mandi. Currently he is serving the School of Chemical Sciences, IIT Mandi as professor. Using organic synthesis as key tool, his research group is focusing on developing molecular and macromolecular systems for different applications spanning from electronic fabrication to cellular imaging.

Subrata Ghosh
School of Chemical Sciences
Indian Institute of Technology Mandi
Email: subrata@iitmandi.ac.in

PL-60

Electromagnetic Coupling Effect on the Plasmonic Properties of Gold Nanostructures

Sujit Kumar Ghosh*

Department of Chemistry, Jadavpur University, Kolkata-700032, INDIA

E-mail: skghosh.chemistry@jadavpuruniversity.in

Abstract

The brilliant colors of the dispersions of metallic colloids have been fascinated since antiquity, long before our understanding of light-matter interaction. The ability of noble metal colloids to manipulate light at the nanoscale has pioneered an emerging research area called plasmonics. The physical origin of the light absorption by metal nanoparticles is the coherent oscillation of the conduction band electrons, coined as, localized surface plasmon resonance (LSPR). The resonance frequency of this LSPR is strongly dependent upon the size, shape, interparticle interactions, dielectric properties, and local environment of the nanoparticles. As in many disciplines of fundamental physics, chemistry and biology, the past two centuries have made significant contribution in the investigation of optical phenomena at the nanometer scale pioneered by specific theoretical approaches to solve Maxwell's equations, together with powerful simulation techniques that are able to anticipate experimental observations. In this presentation, the interparticle coupling effect on the localized surface plasmon resonance of gold nanostructures and their plausible applications will be elucidated.

References:

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Personal Profile

Dr. Sujit Kumar Ghosh has received his Ph. D. from Indian Institute of Technology, Kharagpur in 2005. He was a Postdoctoral Research Associate at Tokyo University of Science at Yamaguchi, Japan and Alexander-von-Humboldt Fellow at RWTH Aachen University, Germany. He joined as Assistant Professor at the Department of Chemistry, Assam University, Silchar in 2010. Since 2022, he is serving as Associate Professor at the Department of Chemistry, Jadavpur University, Kolkata. His current research interest includes plasmonic properties of metal/semiconductor nanostructures, electromagnetic coupling effect in self-assembled nanostructures, photophysical aspects of metal-fluoroprobe nanohybrids, functional plasmonic nanostructures for electronics, photonics and biomedical applications.

Sujit Kumar Ghosh
Department of Chemistry, Jadavpur University, Kolkata-700032, INDIA
E-mail: skghosh.chemistry@jadavpuruniversity.in

PL-61

Nitrenium Ions: Ligands, Reagents, Catalysts

Mark Gandelman
Technion – Israel Institute of Technology, Haifa, Israel
E-mail: chmark@technion.ac.il

Abstract

In my lecture, we will discuss versatile chemistry of N-Heterocyclic Nitrenium ions (NHNs) – the nitrogen-based analogs of ubiquitous N-Heterocyclic Carbenes. We will demonstrate coordination ability of these unusual cationic ligands, analyze their properties and their utilization in stabilization of elusive species.[1a,b] Mainly, we will demonstrate that nitrenium ions can be used as Lewis acids.[1c] We will discuss versatile and intriguing reactivity of nitrenium in organocatalysis, frustrated Lewis pairs chemistry[1d] and radical-based chemistry.[1e] In addition, we will reveal how the fundamental understanding of the nitrenium properties led us to the development of triazenolysis reaction - an aza-version of the canonical alkene ozonolysis.[1f]

Reference:

1. (a) Nat. Chem. 2011, 5, 525; (b) Chem.Sci. 2014, 5, 1305; (c) J. Am. Chem. Soc. 2017, 139, 4062; (d) Angew. Chem. Int. Ed. 2020, 59, 23476; (e) J. Am. Chem. Soc. 2022, 144, 23642; (f) Nat. Chem. 2024, doi.org/10.1038/s41557-024-01653-3.

Personal Profile

Mark was born and raised in Moldova, and at the age of 18 he immigrated to Israel. He received a B.Sc. degree in chemistry in 1995 from Tel Aviv University, and a Ph.D. degree in 2003 from the Weizmann Institute of Science under the supervision of Prof. David Milstein. Holding the Rothschild fellowship, Mark performed his post-doctoral studies at Harvard University in the group of Prof. Eric N. Jacobsen. In 2005, he joined the Schulich Faculty of Chemistry in the Technion as an assistant professor and became a full professor in 2020. Mark holds the Abronson Family Chair in Chemistry. His research program encompasses studies in organometallic, organic and main group elements chemistry and homogeneous catalysis.

Prof. Mark Gandelman,
Technion, Israel
Email: chmark@technion.ac.il

PL-62

Halogen bond activation in gold catalysis

Helgi Freyr Jónsson, Daniel Sethio, Julian Wolf, Stefan M. Huber, Anne Fiksdahl,* **Mate Erdelyi***
Department of Chemistry BMC, Uppsala University, 751 23 Uppsala, Sweden
e-mail: mate.erdelyi@kemi.uu.se

Abstract

Gold catalysis has, over the past decades, provided innovative organic transformations under mild conditions with high chemoselectivities. It receives steadily growing attention thanks to its wide synthetic applicability. The catalytically active form, [Ln-Au]+, of ligated gold complexes, [Ln-Au-Cl], is formed via halide abstraction. This is typically achieved by anion exchange upon the addition of an appropriate silver salt to the reaction mixture. Herein, an alternative silver-free route for gold activation is presented, making use of halogen bonding to promote halide abstraction. We demonstrate that a catalytic amount of a strong halogen bond donor efficiently activates both gold(I) and gold(III) catalysts. Following the reaction, both the catalyst and the activator are easily recovered. Importantly, this not only reduces the metal waste in a gold-catalyzed process but also enables its upscaling, possibly opening new avenues for its use in industrial settings. Gold is an expensive and limited resource, and its recyclability is of supreme importance. Based on systematic reaction kinetics, NMR spectroscopic, and computational investigations, we describe the mechanism of halogen bond-activated gold(I/III) catalysis using cyclopropanation as a model reaction. Our discovery paves the way for the development of gold-mediated transformations that allow recycling of the precious gold catalyst and that may thereby become useful also for the large-scale generation of complex molecules.

References:

H. Freyer-Jónsson, D. Sethio, J. Wolf, S.M. Huber, A. Fiksdahl, M. Erdelyi, *ACS Catal.* **2022**, *12*, 7210.

Personal Profile

Professor Mate Erdelyi obtained his Ph.D. in 2004 from Uppsala University under the guidance of Professor A. Gogoll. After postdoctoral studies with Professor Charles L. Perrin at University of California San Diego (2004-2005), with Christian Griesinger (2005-2006) and Teresa Carlomagnio (2007-2008) at the Max-Planck Institute for Biophysical Chemistry, Germany, he started his independent career at the University of Gothenburg, Sweden (2008). He became docent and then full professor at the University of Gothenburg, and moved to Uppsala University year 2017. He has been the head of organic chemistry 2020-2023, and acts as the head of the Department of Chemistry – BMC since 2023.

Awards:
Lindbomska Award - The Royal Swedish Academy of Sciences, 2023
“The golden thank” pedagogic prize, Gothenburg University, 2015
ICSN – Structural, Analytical Chemistry & Biology Award, 2023

Prof. Mate Erdelyi
Uppsala University, Sweden
e-mail: mate.erdelyi@kemi.uu.se

PL-63

Effect on C-2 Carbonylation of Sugar Enol Ethers Towards Altered Reactivities

Debaraj Mukherjee*
Department of Chemical Sciences, Bose Institute, Kolkata
E-mail: debaraj@jcbose.ac.in

Abstract

Glycals are sugar enol ethers that act as versatile chiral pool synthons in the synthesis of bioactive natural products and medicinally important compounds.[1] Glycals can be utilized to construct various chiral intermediates which contain arrays of defined stereocenters. Reactivity of glycals can be further altered by the incorporation of other reactive functional groups. During my lecture, I will be presenting some of the advancement from my lab in launching keto functionality at C-2 of glycals and exploring its reactivity in the synthesis of chiral disubstituted furan, 3-aryl-thio sugars, 1-1/1-3 S/O linked disaccharides.[2]

Reference:

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2. a) N. Hussain, M. Bhardwaj, A. Ahmed, **D. Mukherjee*** *Org. Lett.,* **2019** *21,* 3034-3037. b) I. A. Zargar, N. Sakander, **D. Mukherjee*** *Eur.J.Org. Chem.,***2023,** c) I. A. Zargar, B. Rasool, N. Sakander, **D. Mukherjee*** *Chem. Comm.,* **2023,** *59*, 10448-10451. d) A. Ahmed, N. Hussian, M. Bhardwaj, A. Kumar, **D. Mukherjee*** *RSC Adv.* **2019,** *9,* 22227-22231

Personal Profile

Debaraj Mukherjee obtained his PhD degree in the field of synthetic carbohydrate chemistry from IICB-CSIR Kolkata registered under Jadavpur University, India in 2006. Thereafter, he joined as a scientist at CSIR-Indian Institute of Integrative Medicine (IIIM), Jammu in 2006 March and subsequently elevated to Principal Scientist position in 2017. He worked as Boyscast postdoctoral fellow with Prof David Crich at Wayne State University, USA (2011-2012). His scientific work has been published in ca. 164 original international publications and review articles, 6 book chapters, and 5 patents as Principal Innovator. 16 of his students have been awarded PhD and few of them have joined as faculties in IIT and Central Universities CSIR.

Awards

- Received **ACCT(I) Excellence in Carbohydrate Research Award-2024** sponsored by PfP, Houston, Texas, USA for outstanding contribution to the area of synthetic carbohydrate chemistry
- Selected and participated in the Leadership Development Programme in Science and Technology **(LEADS)** organized by INSA July 2024
- Received “**CSRI Bronze Medal-2023”** by Chemical research society of India at JNU New Delhi by Prof. V. K Singh, IIT Kanpur
- Received **"2020 Professor D.K. Banerjee Memorial Lecture Award”** at Pfizer Symposium on Organic Chemistry organized by Department of Organic Chemistry, Indian Institute of Science, Bangalore, February 2020.

- Received **Dr. H C Srivastava Memorial Award-2019** by the ACCTI Executive Committee members in the International Carbohydrate conference (CARBO-XXXIV) on "Emerging Frontiers in Carbohydrate Chemistry and Glycobiology" held on December 5-7, 2019 at University of Lucknow, Lucknow, India

Prof. Debaraj Mukherjee

Department of Chemical Sciences, Bose Institute, Kolkata

E-mail: debaraj@jcbose.ac.in

PL-64

Nickel-Catalyzed Oxidative Cyclization of π-Systems

Sudipta Ghosh, Aankhi Khamrai, Rajesh Chakrabortty and **Venkataraman Ganesh***
Department of Chemistry, Indian Institute of Technology Kharagpur, West Bengal-721302, INDIA
E-mail: ganesh.v@chem.iitkgp.ac.in

Abstract

Nickel(0) complexes have been traditionally stored and used under highly controlled environments. Our research focuses on bringing sensitive nickel chemistry to the benchtop. We have demonstrated the potential of Schrauzer's Ni(COD)(Duroquinone),[1] an air-, and moisture-stable Ni^0 complex as a catalyst for the reductive coupling of aldehydes and alkynes.[2,3] Control experiments revealed the exceptional bench stability of Ni(COD)(DQ) under ambient conditions for >200 days. The infrastructural cost associated with a glove box for storing and handling $Ni(COD)_2$ was avoided.[4] A wide range of aromatic and aliphatic aldehydes/alkynes furnished the desired silyl allyl ethers in excellent yields and regioselectivities. Further, we demonstrated a regioselective [2 + 2 + 2] cyclotrimerization of 1,3-diynes catalyzed by Ni^0 to provide hexasubstituted benzenes (HSBs). HSBs have significant applications as functional materials and pharmaceuticals. The present protocol exhibited remarkable versatility, transforming 1,3-diynes with diverse alkyl, aryl, and heterocyclic groups to the corresponding HSBs. With the help of control experiments and density functional theory (DFT), the mechanism of the reaction and the origin of regioselectivity was elucidated.[5]

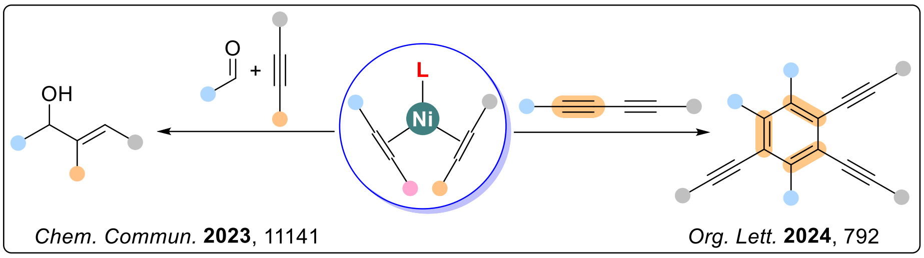

Figure 1: Nickel-Catalyzed Oxidative Cyclization of π-Systems

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Personal Profile

Venkataraman Ganesh received his B. Sc. in Chemistry from Bishop Heber College Tiruchirapalli (2001-2004) affiliated with Bharathidasan University. He then joined the Integrated Ph.D. program (Chemical Sciences) at the Indian Institute of Science (IISc) Bangalore (2004). Ganesh obtained his Ph.D. in 2013, working with Prof. S. Chandrasekaran as a CSIR-Shyama Prasad Mukherjee (CSIR-SPM) fellow. He had postdoctoral stints as a JSPS fellow (2013–2015) with Prof. M. Shibasaki at BIKAKEN, Japan, and as a Newton International Fellow (2016–2018) with Prof. V. K. Aggarwal at the University of Bristol, UK. He started his independent research career in 2018 at the Dept. of Chemistry, Indian Institute of Technology Kharagpur, India, and held the Ramanujan fellowship till 2023 (SERB, India). His research interests include exploiting transition-metal catalysts and boron chemistry to develop new synthetic methodologies and mechanistic studies.

Dr. Venkataraman Ganesh
Department of Chemistry, Indian Institute of
Technology Kharagpur, West Bengal-721302, INDIA
E-mail: ganesh.v@chem.iitkgp.ac.in

PL-65

Design of Multifunctional Mechanically Interlocked Molecules-Based Targeted Imaging Agents

Samit Guha*

Department of Chemistry, Organic Chemistry Section, Jadavpur University, Kolkata 700032, India
E-mail: samit.guha@jadavpuruniversity.in , samitfsu@gmail.com

Abstract

NIR fluorescence (650−1000 nm) has benefits in virtue of deep tissue penetration, a feeble background signal, and minimal autofluorescence that offer an effective tool for super-resolution imaging. I will demonstrate the construction of NIR fluorescent mechanically interlocked molecules (MIMs) for selective targeting and real-time imaging of live-cell organelles.[a,b] Dual-targeted NIR MIMs will be highlighted for living cancer cell-specific active targeting, subsequently selective staining of lysosomes and mitochondria.[b] Single imaging methods, like USG, CT, PET, SPECT, MRI, and fluorescence imaging, have made huge interests in biomedical research and clinical diagnosis. Each imaging tool has its intrinsic benefits and restrictions regarding sensitivity, penetration depths, resolution, and the risk of exposure to radiation (for CT) and radioactive materials (for PET/SPECT). NIR fluorescence (NIRFL) shows extraordinary sensitivity at the molecular level with fast feedback. Hitherto, NIRFL imaging has its inherent constraint, e.g., it is incapable of offering anatomical 3D information. In contrast, MRI displays unlimited penetration depth and affords 3D tomography of soft tissues at a higher spatiotemporal resolution than other imaging techniques. Yet, MRI shows poor detection sensitivity and is unable to monitor molecular events. A single imaging technique is improbable to meet all of the criteria to resolve a diagnostic problem and is incapable of providing comprehensive evidence. The integration of NIRFL and MRI is beneficial as they don't involve detrimental ionizing radiation and radioactive substances. Nevertheless, most of the NIR probes often suffer from quenching, which is a serious alarm when they are capped onto a magnetic Fe_3O_4 NP-based MR contrast agent. We found that quenching and bleaching of the marker inside the live-cell and the aggregation of dye problems could be mitigated by capturing the dye inside a macrocycle to construct MIMs that are capped on the Fe_3O_4 NPs.[c] Water-soluble, noncytotoxic MIMs-capped Fe_3O_4 NPs are utilized for live-cell mitochondria-targeted NIR fluorescence in amalgamation with T_2-weighted MRI with a high relaxation rate (r_2) of 180.7 mM^{-1} s^{-1}.[c] Yet the main problem in confocal laser scanning microscopy is the resolution limit of ~200 nm that is unable to resolve mitochondrial cristae. Stimulated emission depletion (STED) nanoscopy has been shown as a prevailing imaging toolkit and has the ability to bring a definitive revolt to contemporary bioimaging. A NIR fluorescent MIMs-peptide conjugate will be demonstrated that can be used for live-cell super resolution targeted STED microscopy.

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(c) R. S. Das, D. Maiti, S. Kar, T. Bera, A. Mukherjee, P. C. Saha, A. Mondal, S. Guha, *J. Am. Chem. Soc.* **2023**, *145*, 20451–20461.

Personal Profile

Dr. Samit Guha obtained his PhD from the Indian Association for the Cultivation of Science, India (2009). After postdoctoral research at Florida State University, USA (2010-2011); Alexander von Humboldt Fellow, University of Göttingen, Germany (2011-2013); University of Notre Dame, USA (2014–2015), he joined as a Senior Research Scientist (2015-2016) at TCG Life Sciences Private Limited, India. Then he moved to the University of Gour Banga India, and started his independent research carrier as an Assistant Professor (2016-2017) in the department of Chemistry. Dr. Guha currently is an Assistant Professor (2017-till date), Department of Chemistry, Organic Chemistry Section, Jadavpur University, Kolkata, India. His research is focused on mechanically interlocked molecules, multimodal imaging, selective targeting and imaging of cellular organelles, mitochondria tracking peptides, NIR organic biomarkers and biosensors, molecular recognition, solid phase synthesis on resin, and supramolecular machines.
Awards:
DST-SERB Early Carrier Award (2018), Government of India
Innovator Award (2014), Florida State University, USA
Alexander von Humboldt Fellow (2011-2013), Germany.

Dr. Samit Guha
Department of Chemistry, Organic Chemistry
Section, Jadavpur University, Kolkata 700032, India
E-mail: samit.guha@jadavpuruniversity.in ,
samitfsu@gmail.com

PL-66

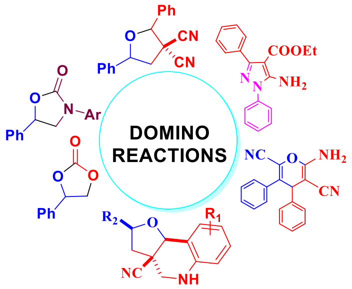
Organocatalytic Domino Protocol: A Potential Tool for the Synthesis of Biologically Prevalent Ring Systems

Sandipan Halder*

Department of Chemistry, Visvesvaraya National Institute of Technology, Nagpur
South Ambazari Road, Nagpur 440010, Maharashtra
Email: sandipanhalder@chm.vnit.ac.in

Abstract

Domino reactions could be defined as a single-pot multi step reaction where all the intermediates undergo sequential conversion without any isolation or addition of any reagents.[1a] Catalytic domino techniques have been utilized for the synthesis of complex molecular entity through an efficient step economic way.[1b,c] In our approach, we have developed a Hydrogen Bond Donor (HBD) catalyst for the domino ring opening cyclization reaction of epoxide for the stereoselective synthesis of functionalized tetrahydro furans, oxazolidinones, cyclic carbonates and pyran derivatives.[2,3]



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Personal Profile

Dr. Sandipan Halder has completed his doctoral program from the department of Chemistry Indian Institute of Technology Kanpur (IITK) under the supervision of Professor Manas K. Ghorai. In his first post-doctoral research in the Bar Ilan University, Ramat Gan, Israel, he has worked in the field of Physical Organic Chemistry under the supervision of Professor Shmaryahu Hoz. After that he has been awarded prestigious Indo-USA Fulbright-Nehru Post-doctoral fellowship from United States India Educational Foundation (USIEF) to pursue post-doctoral research the department of Chemistry & Biochemistry at The Ohio State University, Columbus, Ohio, USA under the supervision of Professor T. V. RajanBabu. In this duration he was involved in the research field of asymmetric catalysis for the hydrovinylation reactions. After returning back from USA, he joined the department of Chemistry National Institute of Technology (NIT) Jamshedpur for a short period of time. Later on, he moved to the Visvesvaraya National Institute of Technology (VNIT), Nagpur as an Assistant Professor in the year of 2016. He has been awarded research grant under Early Career Research from the SERB, Govt. of India and Indo-Russian and Indo-Philippines collaborative research grant from DST, Govt. of India.

At present Dr. Halder's research group is working in the field of organo catalysis precisely Hydrogen Bond Donor (HBD) catalysis. The catalytic methods have been applied are for installation of CO_2 in organic small molecules as well as for the stereoselective synthesis of heterocycles (APIs).

Awards
Fulbright Nehru Post-Doctoral Fellowship
Early Career Research Award from DST-SERB, Govt. of India.
Indo-US Fulbright-Nehru post-doctoral research fellowship

Dr. Sandipan Halder
Department of Chemistry, Visvesvaraya National Institute of Technology, Nagpur
South Ambazari Road, Nagpur 440010, Maharashtra, India
Email: sandipanhalder@chm.vnit.ac.in

PL-67

Development of functionalized porous materials and their catalytic applications

Sk. Manirul Islam *

Department of Chemistry, University of Kalyani, Kalyani, Nadia, 741235, W.B., India
Phone: 91- 9231572961(Mobile), 91-33-2582-8750 (O), Fax: 91-33-2582-8282
Corresponding authors & presenting authors address (Email: manir65@rediffmail.com)

Abstract

Catalysis plays a significant role in the growing demand for industrial processes. Synthesis of cyclic carbonates via CO_2 cycloaddition reaction with epoxides is one of the promising strategies to valorize greenhouse gas CO_2, thereby fixing it to the value-added chemicals. It is one of the most ‘green’ approach for the preparation of fine chemicals which have been highlighted in several publications [1-3]. Application of covalent organic framework based catalysts in carbon dioxide fixation reactions has been received attention in recent years due to their potential advantages over the homogeneous ones [4-7]. The present work consists of synthesis, characterization and catalytic evaluation of different porous materials based catalysts and their applications in CO_2 fixation reactions. These catalysts have been characterized by powder XRD, TEM, EDX, FT-IR, EPR, BET, XPS, SEM-EDX, UV-vis spectral studies and thermo gravimetric analysis. The catalytic activities were tested on various epoxides. Influences of various reaction parameters were studied. The catalyst exhibits significantly high turn over numbers (TON, order of 10^5) and more than 99 % selectivity towards synthesis of cyclic carbonates with exceptional recyclability. Moreover, these catalysts acted as a truly heterogeneous catalyst and can be reused for several times without significant loss in activity. Thus good catalytic activity and efficiency of these catalysts in the carbon dioxide fixation reaction suggest that the present catalytic systems would be useful to synthesize industrially important fine chemicals.

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Personal Profile

Awards and Honours: (i) FRSC in Chemical Science in 2023 (ii) Fellow of West Bengal Academy of Science and Technology in Chemical Science in 2024 (ii) Name included in top 2% Scientists of the world according to the updated list published by Stanford University in 2020, 2021,2022,2023 in Chemical Science.

Education/Position: Prof. Islam did his M.Sc. in Pure Chemistry, from University of Calcutta during 1991-1993. He did his Ph.D. from IIT Kharagpur during 1994-1999 and postdoctoral research from State University of New York, USA during 2000-2001. **At present he is serving as a Professor in the Dept. of Chemistry, University of Kalyani.Current Research Area**: The major focus of our research is to design and synthesis of functionalized porous materials, COFs, MOFs, POPs, and their catalytic applications towards CO_2 chemistry, **CO_2 fixation to value-added chemicals,** *in situ* transformation of CO, catalytic conversion of CO into value-added chemicals, **CO_2 reduction reactions**. etc.**Prof. Islam has published his research work in various reputed journals mentioned below and he is a reviewer of various reputed journals.**Chemical Communications, Green Chemistry, Journals of Materials Chemistry. Dalton Transactions, Chem Cat Chem, Catalysis Science and Technology, Tetrahedron Letter, J Organometallic Chemistry, J. of Colloid and interface Sciences, New Journal of Chemistry, Journal of Molecular Catalysis, Applied Catalysis, A General, Catalysis Letters, Material Advances, ACS Sustainable Chemistry and Engineering, etc.; **Total no of Publication in reputed international journals- 194**

Sk. Manirul Islam *
Department of Chemistry, University of Kalyani,
Kalyani, Nadia, 741235, W.B., India
Email: manir65@rediffmail.com

PL-68

Sustainable Synthesis of Molecular Materials for Engineering and Biomedical Applications

Nishikanta Singh, Priyank Sinha, Bhanendra Sahu, Subrata Dolui and **Sanjib Banerjee***
Department of Chemistry, Indian Institute of Technology Bhilai, Durg 491001, Chhattisgarh

E-mail: sanjib.banerjee@iitbhilai.ac.in

Abstract

Researchers have created stimuli-responsive smart polymeric materials as novel materials for use in energy, sustainability, and healthcare applications since living things naturally react to stimuli. These polymeric materials undergo physical, chemical, and configurational changes in response to changes in the pH, temperature, electric/magnetic field, and other environmental factors. Multi-stimuli responsive polymers are the material of choice for the development of sensors and actuators for biomedical and engineering applications because they provide greater diversity, functionality, and control than single or dual-stimuli responsive polymers. However, if these materials are to be used in the future, careful synthesis is needed. This is complicated by (a) the requirement for strict reaction conditions in multi-step synthesis techniques and (b) the challenge of changing different material properties. We've created a sustainable synthesis protocol for the production of next generation of stimuli responsive molecular materials for applications as functional coating material with tunable wettability, 3D printing, oil-spill remediationb, self-healing sealant material, antifouling materials and nanocarrier for anti-cancer drug delivery.

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[4]B. Sahu†, S. Dolui†, S. Maity, K. C. Gurajala and S. Banerjee*, ACS Appl. Eng. Mater. 2024, 2, 1866–1872.

Personal Profile

Dr. Sanjib Banerjee obtained his Ph.D. in 2013 from Indian Association for the Cultivation of Science under the guidance of Professor Tarun K. Mandal. After postdoctoral studies with Professor Rudolf Faust at University of Massachusetts Lowell, USA (2013-2015) and with Dr. Bruno Ameduri at ENSCM, France (2015-2016), he started his independent career as an Assistant Professor at IIT Bhilai in 2017. He is currently an Associate Professor at Indian Institute of Technology Bhilai. He is currently associated with the Department of Chemistry and Dept. of Materials Science & Metallurgical Engineering at IIT Bhilai. He leads the "Macromolecular Biomaterials Laboratory" at IIT Bhilai. His research group is working on the development of innovative materials as key elements for healthcare, sustainability, and energy applications. He is the author/coauthor of 69 peer-reviewed journal publications and 8 book chapters. He is also the (co)inventor of 5 patents. Dr. Banerjee has been the PI on over 7.3 Cr INR of funding in the past 7 years. He served as an Associate Editor of Frontiers in Chemistry journal from Feb, 2022 to Feb, 2024. Since, Feb, 2024 and Head of the Dept. of Chemistry, IIT Bhilai from Aug, 2020 till Aug 2024. Since, Feb, 2024, he has been an Editor of Elsevier-Materials Today Communications Journal.

Awards
2025 Polymer Chemistry Pioneering Investigator-2025 by Royal Society of Chemistry-Polymer Chemistry Journal
2023 Chemical Research Society of India (CRSI) Bronze Medal for the year 2024
2023 Next Generation of Polymer Researchers-2023 by Wiley-Macromolecular Chemistry and Physics Journal
2020 Polymer Chemistry Emerging Investigator-2020 by Royal Society of Chemistry-Polymer Chemistry Journal
2019 Early Career Research Award by SERB, Government of India
2016 Ramanujan Fellowship by SERB, Government of India

Dr. Sanjib Banerjee
IIT Bhilai, India
E-mail: sanjib.banerjee@iitbhilai.ac.in

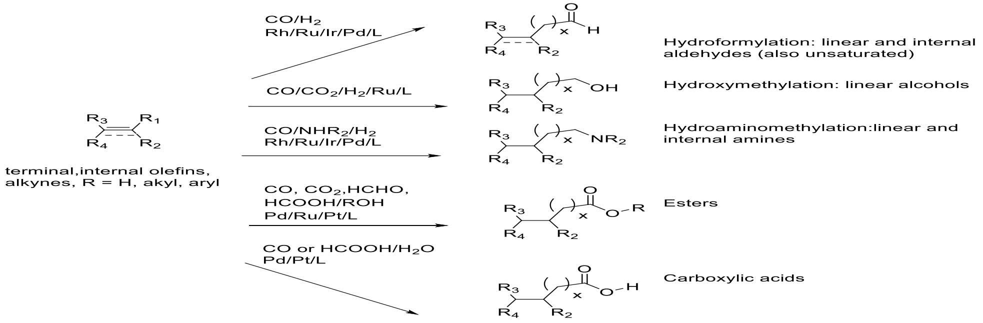
PL-69

Homogenous Carbonylations of olefins and alkynes

R. Jackstell
Leibniz Institut für Katalyse, Albert Einstein Straße 29 a, 18059 Rostock, Germany
e-mail: Ralf.Jackstell@catalysis.de

Abstract

Carbonylations of unsaturated hydrocarbon compounds belongs to the most important homogeneous catalyzed reactions in industry[1]. Examples are the applications in hydroformylations of olefins (e.g. for plasticizers, 10 mio t/year) ore alkoxycarbonylations for polymer precursors [e. g. MMA, Lucite alpha (Mitsubishi)…]. Within the last twenty years several improvements led to more environmentally benign applications in industry but also in academics. These developments are based on the use of new catalysts(e.g. alternative metals[2]) the use of known and unusual olefin feedstocks[3], different nucleophiles (alcohols, amines, amides, water) as well as the application of carbon monoxide surrogates like alkylformates, formaldehyde[4], CO_2[5], and formic acids[6] and end up not only in industrial (bulk, pharmaceutical) but also in academic research applications(Scheme 1).



Scheme1: Carbonylations of unsaturated hydrocarbons.

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Personal Profile

Dr. R. Jackstell, studied mathematics and chemistry from 1989-1994. From 1995-1998 made his research on organophosphorous Chemistry and obtained his Ph.D. in 1998 from the University of Rostock under the guidance of Dr. Arno Balszuweit. After postdoctoral studies at the Institute of organic Catalysis(IFOK) with Professor M. Beller he became a topic leader (Organic Bulk Chemicals, now Applied Carbonylations) 2002 in the same workgroup (Applied Homogeneous Catalysis) at the Leibniz Institute for Catalysis(LIKAT).
During this time he was an author of app.175 publications and inventor of >120 patents.

Dr. R. Jackstell
Leibniz Institut für Katalyse, Germany
e-mail: Ralf.Jackstell@catalysis.de

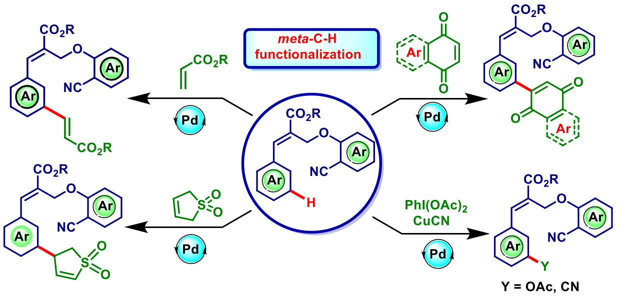
PL-70

Distal *meta*-C–H functionalization of α-substituted cinnamates

M. Bakthadoss
Department of Chemistry, Pondicherry University
Email: bhakthadoss@yahoo.com

Abstract

Regioselective C-H activation of arenes is a promising approach for accessing vital functionalized motifs. Achieving regioselectivity *via* transition metal-catalyzed C–H functionalization of arenes has been challenging among the scientific community over the past several years.[1-5] On the way to overcome the selective cleavage of specific C-H bonds, we have developed unprecedented transition metal-catalyzed *ortho*- and *meta*-C–H bond activation / functionalization strategies for various aromatics. Although the concept of directing-group (DG) assistance resolves the issue of the selective functionalization of the proximal C–H bond, the distal *meta*-C–H bond activation is still challenging. Towards this, recently we have developed a novel *meta*-C–H bond functionalization of α-substituted cinnamates using nitrile as the DG which is the keynote of this talk.[6] Several coupling partners such as naphthoquinone, benzoquinones, maleimides, and sulfolene were introduced as new entrants in the *meta*-C-H functionalization reaction for the first time. A late-stage functionalization was achieved by using a variety of acrylates tethered bioactive molecules like paracetamol, naproxen, cholesterol, etc., which produced the desired *meta*-olefinated products.



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Personal Profile

Prof. M. Bakthadoss obtained his Ph.D. degree from the University of Hyderabad under the guidance of Prof. D. Basavaiah. After three years of postdoctoral studies with Professor George R. Negrete at the University of Texas at San Antonio, Texas (2002 - 2005), he started his independent career as an Assistant Professor at the University of Madras (2006 – 2012). In 2012, he moved to Pondicherry Central University as an Associate Professor (2012 – 2015) and got elevated to a full Professor in 2015. He has more than 20 years of Teaching and Research Experience. To his credit, he has published more than 70 research articles in highly reputed international journals and 13 Research scholars were awarded Ph.D degree under his supervision.

Awards and Honours

1. Awarded Outstanding Young Scientist grant by DST, New Delhi in 2006.
2. Awarded with the Fellow of the Academy of Sciences, Chennai (FASCh) 2021.
3. Awarded Bronze Medal by Chemical Research Society of India (CRSI), 2022.
4. He has completed several research projects which are funded by DST (ANRF), CSIR and UGC.

Prof. M. Bakthadoss
Department of Chemistry, Pondicherry
University
Email: bhakthadoss@yahoo.com

PL-71

Bioinspired Models for Copper Oxidases: Experimental and theoretical approach

Mariappan Murali*

Department of Chemistry, National College (Autonomous), Tiruchirappalli - 620 001, INDIA

E-mail: murali@nct.ac.in

Abstract

Metalloenzymes mediate a wide range of important chemical reactions; often including small molecule substrates or products such as molecular oxygen, hydrogen, nitrogen, and water.[1a] Inorganic chemists are actively engaged in elucidating the structure, spectra, and mechanism of action of these biological catalysts by a synthetic modeling approach that involves biomimetic experiments. Understanding the makeup and function of metalloenzymes has required a great deal of effort. The goal is to understand some of the natural ways nature has created to do seemingly impossible tasks while simultaneously developing systems that can perform biomimetic chemical alterations.[1b] Bioinorganic principles are employed for reasons other than catalysis. The chemistry of metal ions in coordination settings that closely resemble those in biological systems in terms of structure, spectroscopic characteristics, and most importantly, function, can be determined using synthetic models. It is possible to identify important elements that contribute to the unique characteristics of the metal center at an active site through systematic modifications in ligand design that include either the first coordination sphere, the second coordination sphere, or both.[1c]The goal of designing, synthesizing, and studying the small molecule activation chemistry of copper(II) is not to copy the exact enzyme active site.[1d] Instead, it is to include a number of similar features that allow focused investigations of structure-function relationships and/or the nature of proton/electron transfer events. In the same way that biochemical results inspire the design of new copper complexes, more effective model systems, we point out that a comprehensive inorganic chemistry perspective grounded in experiment and theory is invaluable for critical evaluations of biochemical studies as well as elucidations of certain details that are inaccessible in direct enzyme studies.

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Personal Profile

Dr. M. Murali obtained a B.Sc., M.Sc., M.Phil., and Ph.D. Chemistry from Bharathidasan University, Tiruchirappalli; Undergone advanced research training in bioinorganic chemistry as a DST-BOYSCAST visiting young scientist under Prof. Jan Reedijk, Leiden University, The Netherlands. He started independent research as an Assistant Professor at National College (Autonomous) in 2011. He has completed 3 Ph.D., 16 M.phil., and 36 M.Sc. dissertations. His research topics are (a) Synthetic Models for Blue Copper Proteins, (b) Ruthenium(II) Complexes Containing Thioether Ligands, (c) Biomimetic Catalytic Oxidations using Ruthenium(III) Complexes, (d) Non-covalent DNA Binding, BSA Interaction, Cytotoxicity and Anticancer mechanisms, and (e) Models for Copper Oxidases. He published 30 articles in peer-reviewed and reputed international journals and two books. His h-index is 11. Also, he has awarded two DST-SERB (New Delhi) sponsored research projects. Dr. Murali participated in 75 conferences and delivered several lectures, and his students received more than 15 Best Paper/Oral Presentation awards at national and international conferences. He is a life member of CRSI, RJSF, and RSC. He conducted/organized many national and international events.

Awards
BOYSCAST Fellowship
CRSI Best Teacher Award
Teacher Fellowship - Academies of Sciences, India
RSC Inspiration Committee Award

Mariappan Murali
Department of Chemistry, National College (Autonomous),
Tiruchirappalli - 620 001, INDIA
E-mail: murali@nct.ac.in

PL-72

From Catalysis to A Device in Market: On Soft-oxometalates

Soumyajit Roy*

EFAML, Materials Science Center, Department of Chemical Sciences,
Indian Institute of Science Education & Research Kolkata, 741246, WB, India.
E-mail: s.roy@iiserkol.ac.in
Website: soumyajit-roy.com

Abstract

Soft-matter systems based on charged metal oxides are studied by us over the last years in the form of soft-oxometalates (SOMs). Such studies have helped us to see the effect of time on SOMs and enabled fabrication of catalytic micro-chips to plastic conductors. The understanding of time related information of such systems are useful. Such insights can help us to achieve catalytic applications of CO_2 reduction to C_1, C_2 products like formic acid, formaldehyde, methanol, ethanol, ethanoic acid etc. Another recent study of a soft-matter system that we developed as a platform to study the signature of time is Time-Gel where we model evolution and origin of matter. With such platforms we have the opportunity to create and even harness transient states for catalytic applications and we will discuss it in detail in the light of our other activities. Finally, we will discuss a fabrication of Oxygen Maker Redox (OM REDOX) device that can lead to a novel type of technology for O_2 production by Pneumatically Coupled Oxidation of Water by Electrocatalytic Reactions (POWER).

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Personal Profile

Prof. Dr. Soumyajit Roy was born and brought up in Kolkata, where at present he leads EFAML Materials Science Center of DCS at IISER Kolkata. Soumyajit believes in creating value with chemistry. In that pursuit of value creation, Solaire Initiative Pvt. Ltd., a research innovation Deep Tech Start Up, was founded by Soumyajit with his team of other enthusiastic scientists, engineers, meds, who have created a highly acclaimed Oxygen Maker device, OM REDOX, Your Oxygen Box, to address the Oxygen crisis during SARS-COV-19 pandemic. The product was launched by the Hon'ble Prime Minister of India and included in DBT-BIRAC's book inaugurated by the Hon'ble Science Minister in a book showcasing 75 innovations under 75 years of India. Soumyajit is an alumnus of IIT Delhi, University of Bielefeld (Germany), University of Utrecht (The Netherlands) and BASF-ISIS (JONAS at present) University of Strasbourg (France). An avid reader, Soumyajit, is on the look out to address the immediate next need of our society using Chemical Sciences. Soumyajit serves on the editorial board of several international journals, viz., Journal of Materials and Engineering Materials, Frontiers in Chemistry, Frontiers in Fuels, Chemistry Africa, Materials Open. He has authored till date more than 100 research papers in premier journals like Nature Communications, Angewandte Chemie, Journal of Materials Chemistry A, Nanoletters, etc. He further holds several patents and has also authored more than 10 books including several in Bengali aimed at popularization of science in his mother tongue. Soumyajit is a member of several learned societies and academies, like, Fellow of the Royal Society of Chemistry (FRSC), the Royal Society of Arts (FRSA), Academy of Science and Technology (FAScT), Indian Chemical Society (FICS), Member, American Association for the Advancement of Science (AAAS) and Westfaelia Lippe University Society, Germany. Soumyajit is married to a Neuroscientist. In his free time Soumyajit loves to paint, write and cook.

Soumyajit Roy
EFAML, Materials Science Center, Department of Chemical Sciences,
Indian Institute of Science Education & Research Kolkata, 741246,
WB, India.
E-mail: s.roy@iiserkol.ac.in

PACFK Award Lecture

Saponin: A Green and Efficient Natural Surfactant for Suzuki-Miyaura Cross-Couplings of Heteroaryl Substrates in Aqueous Media at Ambient Conditions

Vinoth Kumar Vinayagam*, **Subir Kumar Sadhukhan**, Sreenivasa Reddy Kasu, Ravi Kumar Maroju,Tanguturi Venkatanarayana Hajay Kumar, Satish Kumar Karre, Dhurwasulu

Abstract

Herein, we report a commercially available natural saponin acting as a surfactant and serving as a micellar catalyst, enabling Suzuki-Miyaura cross-coupling effectively with highly challenging heteroaromatic substrates in water at room temperature. Utilizing this green and sustainable protocol, a broad spectrum of pyridine and pyrimidine substrates, and notably the notoriously unstable 2-pyridyl boronic acid were successfully cross-coupled in moderate to high yields.

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Personal Profile

Subir Kumar Sadhukhan obtained his Ph.D. in 2001 from Jadavpur University, Kolkata under the guidance of Professor Saumitra Sengupta. After postdoctoral studies with Professor Andre Gourdon at CEMES, CNRS, Toulouse, France (2001-2002), he started his independent career with Chembiotech Research International (now known as TCG Lifesciences) as a Research Scientist. He was grown as Team Leader at Chembitech and then joined Curia Hyderabad as a Group Leader (earlier known as AMRI) in 2007. Since then He has been working at Curia,Hyderabad in Discovery Chemistry Department. Now he is working as a Director at Curia, Hyderabad. He got the experience of leading a team of 60-100 member to lead multiple medicinal chemistry projects including leading Curia, Hyderabad Library Capability. He led the designing of 10 million virtual library compounds. He contributed in more than 30 publications in internationally reputed journals. Recently he could contribute in four independent research work while carrying out the responsibility for his job role in the organization. In 2019 he completed Executive MBA from IIM-Ahmedabad.

Subir Kumar Sadhukhan
Ph.D., MBA
Director Discovery Chemistry
Curia Hyderabad

Invited Lectures

IL-1

Controlled Photooxidation *via* Singlet Oxygen Generation by Triplet Harvesting in a Heavy Atom Free Pure Organic Dithienylethene-Naphthalene Diimide

Dr. Arunabha Thakur
Department of Chemistry, Jadavpur University, Kolkata-700032, India
Email: arunabha.thakur@jadavpuruniversity.in

Abstract

Noninvasive control over the reversible generation of singlet oxygen ($^1O_2$) has found the enormous practical implications in the field of biomedical science. However, metal-free pure organic emitters, connected with a photoswitch, capable of generating "on-demand" $^1O_2$ *via* triplet harvesting remain exceedingly rare; therefore, the utilization of these organic materials for the reversible control of singlet oxygen production remains at its infancy. Herein, an ambient triplet mediated emission in quinoline-dithienylethene (DTE)-core-substituted naphthalene diimide (cNDI) derivative is unveiled *via* delayed fluorescence. The quinoline-DTE-cNDI triad displayed enhanced photoswitching efficiency *via* double FRET mechanism. It was found to have direct utilization in controlled photosensitized organic transformations *via* efficient generation of singlet oxygen (yield $\Phi_\Delta \sim 0.55$ in DCM and 0.73 in methanol). The designed molecule exhibits a long-lived emission ($\tau \sim 1.1$ μs) and very small singlet-triplet splitting (ΔE_{ST}) of 0.13 eV empowering it to display delayed fluorescence. Comprehensive steady state and time-resolved emission spectroscopy (TRES) analyses along with DFT calculations offer detailed understandings into the excited-state manifolds of organic compound and energy transfer (ET) pathways involved in $^1O_2$ generation.

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Personal Profile

Dr. Arunabha Thakur obtained his Ph.D. in 2012 from IIT Madras under the guidance of Prof. Sundargopal Ghosh. After postdoctoral studies with Professor Jan. J. Weigand at Technical University Dresden, Germany, he did another postdoc with Prof. Swadhin K. Mandal at IISER-Kolkata. He started his independent research career as DST-Inspire Faculty at NIT Rourkela in 2015 and then he joined Jadavpur University in 2017 as Assistant Professor. Dr. Thakur recently received SERB-International Research Excellence fellowship to carry out the collaborative research work at Texas A&M University, USA with Prof. Francois P Gabbai.

Dr. Arunabha Thakur
Department of Chemistry, Jadavpur University,
Kolkata-700032, India
Email: arunabha.thakur@jadavpuruniversity.in

IL-2

Triplet harnessing and why we should care!

Suvendu Dey, Manoj Upadhyay, Raktim Deka, Manjeet Singh, Tanika Sharma, Sreerang Peethambaran and **Debdas Ray***
Department of Chemistry, Shiv Nadar Institution of Eminence, Delhi-NCR, NH-91, Tehsil Dadri, Gautam Buddha Nagar, Uttar Pradesh, 201314, INDIA
E-mail: debdas.ray@snu.edu.in

Abstract

The conversion of light energy into electronic excitation and subsequently into photo-and/or-chemical energy constitutes fundamental processes in chemistry. An example is the conversion of electronic excitation energy into photon energy through E-type delayed fluorescence observed in Eosin and Benzyl. This phenomenon was initially proposed by Perin (1929), Lewis (1941), Parkar (1961), and Hatchard (1968).[1a-d] Recently, this emission mechanism, termed thermally activated delayed fluorescence (TADF), gained renewed interest as a means to harness non-emissive triplet excited states in OLEDs[2,3], sensing[4] and photocatalysis.[4] The TADF process involves an endothermic reverse intersystem crossing (RISC) (S1←T1) facilitated by vibronic coupling.[1-3] However, achieving shorter-lived triplets with high rates of RISC remains challenging.

Addressing this challenge involves the long-standing goal of exothermic down-conversion (T1→ S1).[5] This presentation explores how both up-and-down conversions processes in organic donor-acceptor systems can be realized to achieve various applications materials science and beyond. The speaker will provide an overview of the quest for and discovery of such systems, the subsequent characterization of their properties, and the future directions in this research area.

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Personal Profile

Professor Debdas Ray obtained his Ph.D. in 2008 from Indian Institute of Technology Kanpur, India under the guidance of Professor P. K. Bharadwaj. After several postdoctoral studies with Professors Dario Bassani at University of Bordeaux (2009-2011, France), Ivan Aprahamian at Dartmouth College (2011-2012, USA), and Takashi Nakanishi at National Institute for Materials Science (2012-2013, Japan), he started his independent career at Shiv Nadar Institution of Eminence, Delhi-NCR. He became Associate Professor at Shiv Nadar Institution of Eminence in 2019.

Awards:

- CRS Bronz medal (Chirantan Rasayan Sanstha) (2024)
- Member of the Royal Society of Chemistry (MRSC) (2024)
- Member of NASI (MNASc, 2024)
- CAS award 2023
- Member of outreach program (SERB)
- Life members (CRS, CRSI, CSI, IPS, ACS, AAAS)
- Grant (Six research grants SERB & DAE) + One conference grant (SERB)

Prof. Debdas Ray
Department of Chemistry, Shiv Nadar Institution of Eminence, Delhi-NCR, NH-91, Tehsil Dadri, Gautam Buddha Nagar, Uttar Pradesh, 201314, INDIA
E-mail: debdas.ray@snu.edu.in

IL-3

Investigation of Nonradiative Relaxation of Tetrabenzoheptafulvalene Derivative by Spin-Flip Time Dependent Density Functional Theory (SF-TDDFT): A Computational Approach to Explore the Aggregation-Induced Emission Mechanism

Aarzoo, **Ram Kinkar Roy***
Department of Chemistry, BITS-PILANI, Pilani Campus, Rajasthan, INDIA
E-mail: rkroy@pilani.bits-pilani.ac.in

Abstract

An effort is made to explore the cause of fluorescence quenching in a tetrabenzoheptafulvalene derivative, 10,10',11,11'-tetrahydro-5,5'-bidibenzo[a,d][7]annulenylidene (abbreviated as THBDBA) in tetrahydrofuran (THF) solution.1a,1b The AIE mechanism of the THBDBA molecule was theoretically investigated using spin-flip timedependent density functional theory (SF-TDDFT).1c The potential energy surfaces (PESs) for the ground (S0) and first singlet excited (S1) states of THBDBA were calculated along the flapping motion of phenyl rings (ϕ and ϕ' torsional angle). The strategies used are the excited-state deactivation processes by taking into account the S1/S0 surfacecrossing, referred to as the 'minimum energy conical intersection' (MECI),1d and the reduction of oscillator strength (f) near the minimum energy gap (MEG) or CI. Our findings reveal a notable reduction in the f-value near the CI for the monomer, showcasing the essential role of the flapping motion of the phenyl rings in achieving this CI in solution. To solidify our findings on the aggregate state, we examined a dimer system. The higher energy gap and f-value at MEG with the dimer system clearly indicate that the MECI may not exist in the actual aggregate. This conclusion arises from the restricted flapping motion of the phenyl rings in the aggregate, driven by steric and electrostatic interactions, which effectively promotes radiative transitions for energy dissipation.

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Personal Profile

Prof. Ram Kinkar Roy obtained his Ph.D. in 1996 from University of Pune (CSIR-NCL) under the supervision of Prof. Sourav Pal. His area of Ph.D. work was in density functional reactivity theory (DFRT). He was a Post-Doctoral Fellow in Vrije Universiteit Brussels (VUB) in 1997-1998 in the group of Prof. Paul Geerlings. Then he moved to the Dept. of Applied Chemistry, Graduate School of Engineering, University of Tokyo as Intelligent Modelling Laboratory Fellow (1998-1999) and then as JSPS Post-Doctoral Fellow (1999-2001) in the group of Prof. Kimihiko Hirao. He returned back to India in 2001 and joined the Department of Chemistry, Birla Institute of Technology and Science Pilani (BITSPILANI) as a Lecturer. In 2013 he was promoted to the position of Professor and in 2023 he has become Senior Professor in the same department. He has visited University of Tokyo in summer of 2002, 2005, 2006, 2007 and 2008. He also visited AICS-RIKEN, Kobe in the summer of 2013 and Faculty of Science, Hokkaido University in 2010 (summer) and 2023-2024 (for 10 months) as JSPS Invitation Fellow. Prof. Roy has published 60 peer reviewed research papers in reputed international journals. Some of his notable contributions are on Non-negativity of Fukui Function indices, N-dependence problem of local hardness descriptor, comprehensive decomposition analysis of stabilization energy (CDASE), Charge transfer limit of a chemical adduct, validation of Hammett's form of Linear free energy relationship (LFER) through DFRT etc. Last few years he is also working on computing reliable photophysical properties of aggregation induced emission (AIE) active molecules using optimally-tuned range-separated hybrid functional (OT-RSH) and time dependent density functional theory (TD-DFT)

Prof. Ram Kinkar Roy,
Dept. of Chemistry, BITS-PILANI,
Pilani Campus,
Rajasthan, India
E-mail: rkroy@pilani.bits-pilani.ac.in

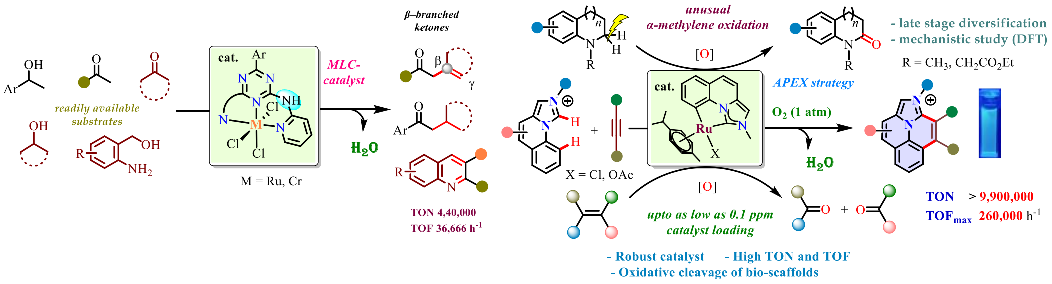
IL-4

Selective C-C and C-O Bond Forming Reaction using Electron-Poor Metal Catalysts

Animesh Das
Department of Chemistry, Indian Institute of Technology, Guwahati, Assam, 781039
E-mail: adas@iitg.ac.in

Abstract

Metal-pincer-complexes are expedient tools in bond-forming reactions in organic synthesis. Their long-term stability and easy functionalization have allowed the development of novel catalytic systems that have had a tremendous impact in various areas of chemistry. The current paradigm primarily focuses on a single active metal site along with the ligands that impart electronic tunability to achieve the substrate binding and activation. In addition, metal-ligand cooperative (MLC) strategy is another important tool to activate the small molecule effectively. Nevertheless, less attention has been made to the molecular level understanding of electron-poor metal complexes in catalysis, particularly electron-poor MLC pincer complexes in catalysis. Owing the motivation of unique electronic feature, herein the present work will be discussed on exploring the electron-poor MLC pincer complexes in synthetically challenging catalytic cross-coupling reactions of ketones and bio-renewable alcohols:[1]The electron-deficient triazine-core bearing NNN-pincer ruthenium(III) and cost-effective chromium(III) complexes are employed in this study towards sustainable synthesis of β-branched ketones and N-heteroaroamtic compounds like quinoline, qunazoline derivetives. By simply replacing the pyridine core to the central triazine-ring corresponding pincer complexes showed exceptional high catalytic activity and long life time in some cases, reaching TONs in the millions. Furthermore, rigid π-conjugated fused imidazo[1,5-a]quinoline (ImQ)-based cyclometalated ruthenium (II)[2] catalysed unusual α-methylene oxidation of synthetically diverse N-substituted tetrahydroquinoline to lactams, oxidation of olefin to carbonyls, aerobic oxidative annulation reaction of alkyne to π-conjugated fused imidazo[1,5-a]quinolin-2-ium derivatives will be discussed. In all case detail mechanistic insight will be disclosed with the help of kinetic studies, and DFT calculation.



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Personal Profile

Dr. Animesh Das was born in Midnapur, West Bengal, India. He obtained his B.Sc. degree majored in Chemistry at The University of Calcutta in 2004 and M.Sc. degree in Chemistry in 2006 at the Indian Institute of Technology, Kanpur, U.P, India. He then pursued his doctoral studies with Prof. Dr. Franc Meyer at the University of Goettingen, Germany. Later on he moved to University of Frankfurt in Germany, and University of Texas at Arlington, Texas, USA for his post-doctoral studies with Prof. Dr. Matthias Wagner and Prof. H. V. Rasika Dias, respectively. Dr. Das embarked on his independent career as an Assistant Professor, The Department of Chemistry, Indian Institute of Technology Guwahati in 2015. In 2021, he has been promoted to the rank of Associate Professor in Chemistry. His research interest is organometallic chemistry and catalysis, C-H activation and functionalization of small molecules for fuels and fine chemicals. Number of publications: 40.

Dr. Animesh Das
Indian Institute of Technology,
Guwahati, Assam, 781039
E-mail: adas@iitg.ac.in

IL-5

BODIPY Based Heavy-Atom-Free Triplet Photosensitizers for Photodynamic Therapy of Cancer

Dr. Soumyaditya Mula
Bhabha Atomic Research Centre, Trombay, Mumbai, India
and
Homi Bhabha National Institute, Anushakti Nagar, Mumbai, India
E-mail: smula@barc.gov.in

Abstract

Despite of having many advantages over the popular cancer therapies, photodynamic therapy still is not widely acceptable for clinical applications. Scarcity of efficient triplet photosensitizers (PSs) is one of the main bottlenecks for this. Next generation photosensitizers (PS) are based on “organelle-targeted-PDT” which provide new paradigm in the field of precision medicines to address the current challenge for treatment of cancer. Although numerous heavy atom attached PSs are developed as PDT agents, but these are not suitable for clinical applications due to several reasons. In this respect, development of new type of twisted BODIPYs as PSs for PDT will be discussed. BODIPYs have rich photophysical properties and structural helicity further enhances their triplet conversion rates which make helical BODIPYs potential candidates as PSs in PDT. Finally, their successful applications as PDT agents in killing of various types of cancer cells will be discussed. One of these dyes are precisely and simultaneously targets endoplasmic reticulum (ER) and lipid droplets (LDs) in pancreatic ductal adenocarcinoma (PDAC). This is established by live cell imaging showing simultaneous dual fluorescence colour due to polar and nonpolar milieu of ER and LDs. High triplet state and singlet oxygen generation of the dye causes robust ER stress and cellular lipid peroxidation, leading to apoptosis in PDAC cells in the presence of light. This makes the new BODIPY dye a potential next generation precision medicine for ER-LD organelle specific imaging and PDT of cancer.

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Personal Profile

Dr. Soumyaditya Mula is working as Scientific Officer at Bhabha Atomic Research Centre (BARC), Mumbai and Associate Professor at Homi Bhabha National Institute (HBNI), Mumbai. He did his graduation and post-graduation from University of Calcutta. He received his PhD degree from University of Mumbai. He had doctoral and post-doctoral training from University of Strasbourg (France). His main focus of research is design and development of organic fluorophore molecules for opto-electronic applications. He has worked extensively on design and synthesis of BODIPY class of fluorescent compounds for the development of novel materials showing diversified applications.

Awards

Society for Materials Chemistry (SMC) Bronze Medal-2024
DAE Young Scientist Award-2014
Young Associateship Award of Maharashtra Academy of Sciences-2011
Raman–Charpak PhD Fellowship for France-2008

Dr. Soumyaditya Mula
Bhabha Atomic Research Centre, Trombay, Mumbai, India and
Homi Bhabha National Institute, Anushakti Nagar, Mumbai, India
E-mail: smula@barc.gov.in

IL-6

NHC-Transition Metal Catalyzed Dehydrogenative Oxidation of Alcohols to Carboxylic Acids

Shanti Gopal Patra
Department of Chemistry, National Institute of Technology, Silchar 788010, Assam, India
Email: shanti@che.nits.ac.in

Abstract

Transition metals can catalyze the conversion of primary alcohols into carboxylic acids and hydrogen gas without needing external oxidants, a crucial reaction in modern organic synthesis. Various research groups reported NHC-coordinated transition metals such as Ru and Ir.[1a] This year, we have reported the syntheses of two new PEPPSI-type (PEPPSI: pyridine enhanced precatalyst preparation stabilization and initiation) palladium N-heterocyclic carbene (NHC) complexes, $[PdBr_2(NHC)Py]$ **(1,2)** [NHC = 3-(3,5-dimethoxybenzyl)-1-(4-methoxy-phenyl)-1*H*-imidazol-3-ium-2-ide (**L1**); 1-(4-methoxyphenyl)-3-(naphthalen-1-ylmethyl)-1*H*-imidazol-3-ium-2-ide (**L2**)], and explored their catalytic potentials for alcohol dehydrogenation (AD) reactions.[2b] The molecular structures of the complexes were determined by single-crystal X-ray analysis. Both the complexes could catalyze the AD reactions; however, under similar conditions, the sterically bulky naphthyl-containing complex **2** showed slightly better activity than the 3,5-dimethoxy benzyl-containing complex **1**. Four possible reaction pathways were computationally examined: one dissociative pathway where both Py and Br^- ligands leave the coordination site, two associative pathways where either Py or Br^- ligand leaves the coordination site, and another where the reaction proceeds through intermediary ester formation. The calculated energy profile studies revealed that the ester formation pathway is the most favorable among the four pathways. This presentation will discuss the comprehensive mechanism of AD reactions compared to earlier reports.

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Personal Profile

Dr. Shanti Gopal Patra received his master's degree (M.Sc.) from the Department of Chemistry, Indian Institute of Technology, Kanpur, in 2012. Then, he went to the Indian Association for the Cultivation of Science (IACS), Kolkata, to perform research work under Prof. Dipankar Datta and Prof. Abhishek Dey and obtained his Ph.D. in 2018. During his Ph.D., he worked on synthesizing N-donor ligands and their transition metal complexes. Further, he worked on the computational analysis of various metal complexes regarding their aromatic property, electronic properties, reaction mechanisms, magnetism, and structural aspects. After completing his Ph.D., he moved to Ariel University, Israel, as a postdoctoral fellow. During his postdoc under Prof. Meyerstein, he studied water-splitting reactions using metal carbonates and other catalytic oxidation processes. He synthesized various metal-based catalysts for OER and HER reactions. Then, he worked as a postdoctoral fellow under the supervision of Prof. Pratim Kumar Chattaraj at the Department of Chemistry, IIT Kharagpur. During his second postdoc under Prof. Chattaraj, he worked on conceptual density functional theory to understand the reactivity and reaction mechanism. He is an Assistant Professor in the Department of Chemistry at NIT Silchar. In his 11 years of research, he has worked on coordination, material, and computation chemistry to study water-splitting reactions and mechanisms. He has published 52 research articles and two book chapters.

Awards:

First Class with distinction in BSc, Burdwan University
Proficiency Medal in MSc, IIT Kanpur
Merit-cum-Means Scholarship, IIT Kanpur
Outstanding Postdoctoral Fellowship, Ariel University, Israel
Institute Postdoctoral Fellowship, IIT Kharagpur

Dr. Shanti Gopal Patra
Department of Chemistry, National Institute of Technology,
Silchar 788010, Assam, India
Email: shanti@che.nits.ac.in

IL-7

Supramolecular Chemistry of Non-Aromatic Electro-Active Luminescent Polymers towards Multi-Purpose Sensing and Opto-Electronic Responses

Dr. Nayan Ranjan Singha

Government College of Engineering and Leather Technology (Post-Graduate), Department of Polymer Science and Technology, Maulana Abul Kalam Azad University of Technology, Salt Lake, Kolkata 700106, West Bengal, India
E-mail: nrsingha@gcelt.gov.in & drs.nrs@gmail.com

Abstract

The design, synthesis, optimization, and development of electro-active multi-emission fluoro-polymer opens up a hot frontier in fabricating high-performance chemosensors and versatile advanced optoelectronic devices. Herein, non-aromatic natural-synthetic hybrid dual-state luminescent conducting polymers, excited-state intramolecular proton transfer (ESIPT)-associated dual-state emissive dual-light emitting conducting polymers, and electro-active chromo-fluorogenic sensors are designed and developped using different combinations of nonconjugated synthetic monomers carrying $-C(=O)OH$, $-SO_3H$, $-OH$, $-C\equiv N$, $-C(=O)NH-$, $-(C=O)N$, $-CH_2OH$, $-C(=O)N(CH_3)_2$, $-C(-O^-)=N^+(CH_3)_2$, $-C(=O)O-CH_2-$, and $-N(CH_3)_2$ functionalities/ sub-luminophores.[1a,b,d and 2b,c,e] Of as-synthesized electro-active fluorescent sensors, nuclear magnetic resonance (NMR) and Fourier transform infrared (FTIR) spectroscopies, fluorescent enhancements (I/I_0), and computational investigation indicate intriguing photophysical and opto-electronic features in the optimum compositions. Importantly, heteroatomic sub-luminophores assisted dipolar and intra-/ inter-molecular conventional and nonconventional hydrogen bonding and dipolar interactions; $n-\pi^*$ transitions; *N*-branching associated rigidity; and hydrophobic interaction contribute to the ESIPT-associated amide-imidol phototautomerism, intramolecular through-space charge transfer (ITSCT), fluorescence resonance energy transfer, aggregation enhanced emissions, dual light emissions in solids and solution states, metal ion sensing, and conductivity.[1a-e and 2a-e] ESIPT-associated dual-state emission/ conductivity, aggregation-enhanced emissions, aggregation-mediated ITSCT in excited state, selective opto-electronic responses toward metal ions, and redox properties are supported by the dual-state absorption spectra, dual-state excitation dependent emissions, solvent-polarity-/ concentration-dependent luminescence, solid-state/ solution-phase luminescence phenomena, aggregation-induced enhanced luminescence, time-correlated single photon counting (TCSPC) studies, microscopic images, electrochemical measurements, and computational calculations.[1a-e and 2a-e] Here, preferential interaction of metal ions (M(II)/ M(III)), fluorogenic sensing, and reduction/ oxidation of M(II)/ M(III)/ M(I)/ M(VI) are substantiated by ultraviolet-visible, FTIR, and X-ray photoelectron spectroscopies; TCSPC measurements; NMR-titration; thermal characterization; electrochemical studies; alongside theoretical calculations. The selective sensing efficiencies of M(II)/ M(III)/ M(I)/ M(VI) are indicated by the very low limits of detections.[1a-e and 2a-e] The proton-electrical conductivities of polymers and metal ion encapsulated polymers in solids/ solutions are validated by current-voltage and electrochemical impedance measurements.[1a,b and 2a]

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2. (**a**) N. Hassan and N. R. Singha et al. *Macromol. Rapid Commun.* **2024**, *45*, 2400363; (**b**) C. Roy and N. R. Singha et al. *ACS Appl. Nano. Mater.* **2023**, *6*, 17952; (**c**) M. Deb and N. R. Singha et al. *ACS Appl. Polym. Mater.* **2023**, *5*, 4820; (**d**) J. S. D. Roy and N. R. Singha et al. *ACS Appl. Bio Mater.* **2022**, *5*, 2990; (**e**) J. S. D. Roy and N. R. Singha et al. *ACS Appl. Polym. Mater.* **2022**, *4*, 1643.

Personal Profile

Dr. Nayan Ranjan Singha obtained Ph.D. from University of Calcutta and underwent postdoctoral studies at University of Calcutta and Jadavpur University, Kolkata, India. Dr. Singha joined as a faculty of post-graduate division at Government College of Engineering and Leather Technology (Post-Graduate), Maulana Abul Kalam Azad University of Technology, Kolkata, India. Dr. Singha has been working on **i.** synthesis of aliphatic electro-active light-emitting polymers, conducting macromolecules, and redox-active multi-light emitting polymers suitable in chromo-fluorogenic sensing, electrochemical-/ fluorogenic-sensing, and photodegradation; **ii.** Synthesis of stimuli-responsive functional polymers via RAFT, emulsion, and solution polymerization for organic electrode fabrication, sensing, oxidation-reduction, and bioimaging; and **iii.** Polymer and collagen based hybrid biocomposite and modified graphene-/ MNP-based polymer nanocomposites for sensing, electrocatalysis, and separation. Dr. Singha published more than eighty (80) research items including articles, reviews, and book chapters. Dr. Singha has completed two DST sponsored major research projects and another major research project sponsored by CSIR (Government of India). Since 2023, Dr. Singha has been serving as Editors of Scientific Reports-Nature and PLoS One (Macromolecular Chemistry Section).

Dr. Nayan Ranjan Singha
Government College of Engineering and Leather Technology (Post-Graduate), Department of Polymer Science and Technology, Maulana Abul Kalam Azad University of Technology, Salt Lake, Kolkata 700106, West Bengal, India
E-mail: nrsingha@gcelt.gov.in & drs.nrs@gmail.com

IL-8

"There's Plenty of Room at the" Interface

Tanushree Sanyal Bala
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: tanushreebala@gmail.com

Abstract

Semiconductor-noble metal hybrids, while long understood as critical to bulk devices, has particular significance inthe nano-size domain where quantized energy levels in the semiconductor and plasmonic resonances in the metalallow the possibility of unique size defined heterojunctions to be realized. Thus recent advances aim the synthesis of semiconductor-noble metal hybrids via a number of contemporary techniques.We, in our laboratory, explored a new route to achieve such heterojunctions via Langmuir-Blodgett (LB) technique which had been quite unfamiliar in this domain. Semoconductor nanoparticles with variable architectures were assembled at air-water interface by choosing proper surface capping agent. The monolayer was allowed to interact with chloroauric acid from subphase which initiated the direction-specific growth of Au-seeds on semiconductor nanoparticles as they relinquished their orientational flexibility in that close-packed assembly which was reflected in surface pressure–area (P–A) isotherms. Depending on the structure and shape of the semiconductor particles, exposure of surface area to the subphase was varied and so did the Au coverage accordingly. In case of porous 3D semiconductor materials, chloroaurate ions went inside the pores by capillary action and grew inside. All these materials were well characterised by various techniques. We tried to postulate a mechanism to bring all the syntheses under one umbrella which will be discussed in detail.

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Personal Profile

Dr. Tanushree Sanyal (Bala) received her MSc in Chemistry from Jadavpur University, Kolkata, India in 2002 and her PhD in Chemistry (Materials Science) from CSIR-National Chemical Laboratory, Pune, India in 2007. After postdoctoral research at the University of Limerick, Ireland, she joined the University of Calcutta, Kolkata, India. She is currently an Associate Professor at the Department of Chemistry, University of Calcutta. Dr. Bala works on the syntheses, characterizations and applications of different types of nanomaterials. Apart from that, her research encompasses the basic understanding of interaction of surface active molecules with various entities at variable physico-chemical environment. She has published more than 50 research articles in reputed international journals. Recently their work has been highlighted on the cover page of the renowned ACS journal Langmuir (Year 2024, Vol 40, Issue 31).

Awards:

1) 10th Venus International Women Awards – VIWA 2025 in the category of Outstanding Woman Researcher in Materials Science
2) Syamasri Gupta memorial award 2013 from Indian Society of Surface Science and Technology (ISSST) as a junior researcher working in the field of surface science and nanotechnology.
3) Fellowship from Science Foundation Ireland (SFI).
4) Fellowship funded by Enterprise Ireland Commercialisation Fund.

Tanushree Sanyal Bala
Department of Chemistry, University of Calcutta, 92
A. P. C. Road, Kolkata-700009, INDIA
E-mail: tanushreebala@gmail.com

IL-9

Harnessing Nanomaterials for Solar-Driven Photoelectrochemical Water Splitting: Chemistry for a Sustainable Future

Subhasis Roy
Department of Chemical Engineering, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: subhasis1093@gmail.com/ srchemengg@caluniv.ac.in

Abstract

One of the most promising fields in renewable energy research is the application of nanomaterials for solar-driven hydrogen production. This approach offers a clean, efficient, and eco-friendly solution to combat the global energy crisis while minimizing carbon emissions. By harnessing the potential of nanomaterials, India can accelerate its shift towards sustainable energy systems, stimulate economic growth, and position itself as a leader in global clean energy innovation. Optimizing the interplay between the structure, properties, and processing of composite nanostructured materials is vital for unlocking their full potential. Our research thoroughly explores the synthesis, characterization, and applications of diverse nanomaterials, with a primary emphasis on their use in water splitting and perovskite solar cells. We have successfully engineered a cost-effective, high-efficiency water-splitting cell by combining charge carrier metal oxide multidimensional perovskite thin film photoanodes. By tailoring the material morphology, we aim to develop perovskite and metal oxide photoanodes with nanostructured architectures that exhibit enhanced photocurrent generation and improved surface catalytic activity. These innovative nanostructured materials address critical challenges, such as limited hole diffusion lengths, while significantly enhancing photocurrent performance. Dimensional control and doping techniques have been strategically employed to fine-tune the spectral absorption properties of the materials. The overarching goal is to fabricate advanced nanostructured thin films that drive sustainable and renewable energy technology advancements. The hybrid nanoparticles ' detailed structural and morphological characterizations were performed using advanced techniques, including X-ray diffraction, electron microscopy, and optical spectroscopy. Additionally, efforts have been directed toward improving the efficiency of thin-film solar cells by optimizing manufacturing processes and incorporating environmentally friendly materials.

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(c) S. Maitra, S. Halder, T. Maitra, and S. Roy, New Journal of Chemistry (RSC),. 2021,45, 7353-7367

Personal Profile

Dr. Subhasis Roy is currently serving as an Assistant Professor in the Department of Chemical Engineering at the University of Calcutta. He obtained his Ph.D. in Materials Science from the Indian Institute of Technology, Kharagpur. Prior to joining Calcutta University as a faculty member, he gained research experience as a Postdoctoral Researcher at Sungkyunkwan University, South Korea, and as a Research Associate at IISER Kolkata. He was also a visiting researcher and Raman Fellow at Ohio University, CEER, USA. Dr. Roy has an extensive academic portfolio, with over 110 publications, including 85 peer-reviewed scientific research papers, 30 conference publications, and 30 invited talks. He has authored over 50 book chapters, 6 books, and has served as editor for 4 books. In addition, he holds 18 national and international patents (published/granted). Dr. Roy has supervised 4 PhD dissertations, 11 M.Tech theses, and 26 B.Tech projects.A recipient of numerous accolades, Dr. Roy has been honored with the UGC Raman Postdoctoral Fellowship, the Young Scientist Award at NTU@One-North, Singapore, the DST Fast Track Young Scientist Start-Up Research Grant from SERB-India, the ECS Travel Grant Award (USA), and the Research Grant under the Mission Innovation Programme jointly funded by DBT and DST-India. He has also received the Teachers Associateship for Research Excellence (TARE) by SERB-India and the Star-2 Grant from the Ministry of Education-India.Dr. Roy is a Fellow of the Indian Chemical Society and the International Society for Research and Development. He actively contributes as an editorial board member and reviewer for multiple international journals, including ACS Nano, Advanced Materials, Chemical Engineering Journal, Polymer Engineering and Science, and Construction and Building Materials. He is also a member of the Royal Society of Chemistry, National Academy of Sciences, India, and other esteemed professional societies.His research interests include Photocatalysis, Green Synthesis of Nanomaterials, Perovskite Solar Cells, Water Splitting H_2 Generation, Photocatalysis, Surface Chemistry, High Dielectric Constant Materials, Supercapacitors, and Nanocomposites for Environmental and Energy Applications.

Subhasis Roy
Department of Chemical Engineering, University of
Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: subhasis1093@gmail.com/
srchemengg@caluniv.ac.in

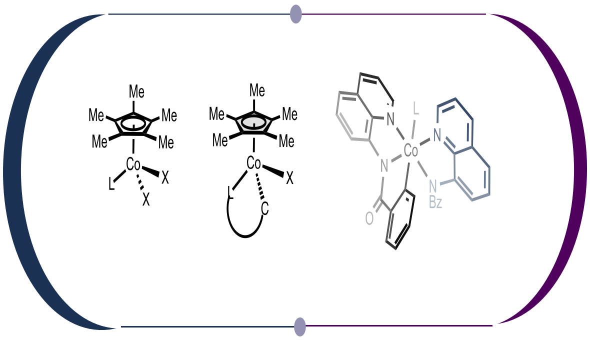
IL-10

Evolution of Co(III)-Catalysis in Asymmetric C-H Bond Functionalizations

Pardeep Dahiya, Rajib Mandal, Abir Das and **Basker Sundararaju***
Department of Chemistry, Indian Institute of Technology Kanpur, Kanpur, India.
E-mail: basker@iitk.ac.in

Abstract

Since Murahashi's pioneering work on cobalt-catalyzed C-H bond carbonylation in 1955,[1] the field of C-H bond functionalization has significantly advanced, especially with the introduction of low-valent cobalt systems.[2] Although the use of in situ-generated or isolated cobalt(III) catalysts for C-H activation was rarely explored until the independent studies by Matsunaga and Daugulis in 2014,[3] recent developments have illuminated the complex coordination environment surrounding cobalt and the mechanisms involved in these catalytic cycles.[4e-f] Over the past decade, our research group has focused on understanding the coordination environment of cobalt in the +3 oxidation state and leveraging its intrinsic properties for a range of catalytic applications, including hydrogenation, dehydrogenation, hydrogen production, and C-H activation. In this talk, I will discuss the progress made in Co(III)-catalyzed C-H bond functionalization[4-6] utilizing both mono- and bidentate directing groups. Additionally, I will discuss the role of spectator ligands in this context and their replacement with external chiral ligands to induce chirality at the metal center through an enantiodetermining C-H activation step, illustrating how these factors influence the efficiency and selectivity of asymmetric transformations.[5] Furthermore, I will present innovative strategies that utilize photocatalysts[4c,6a] or oxygen as sole oxidants,[6b] effectively eliminating the need for stoichiometric metal oxidants in our asymmetric C-H bond annulations with the Co/Salox catalytic system. This discussion will highlight both the fundamental insights gained and the practical applications emerging from this dynamic area of research.



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Personal Profile

Professor Basker Sundararaju is a Prof. of the Department of Chemistry, Indian Institute of Technology Kanpur, Kanpur, Uttar Pradesh, India – 208016. E-mail: basker@iitk.ac.in

Since 2022	Professor, Department of chemistry, IIT Kanpur, Kanpur, India
2018-2022	Associate Professor, Department of chemistry, IIT Kanpur, Kanpur, India
2014-2018	Assistant Professor, Department of chemistry, IIT Kanpur, Kanpur, India
2013-2018	Assistant Professor (cont), Department of chemistry, IIT Kanpur, Kanpur, India
2011-2013	Postdoctoral Fellow at Max-Planck Institute of Coal Research, Muelheim (with Prof. Alois Fuerstner)
2008-2011	PhD, Université de Rennes1, Rennes, France
2008	MS, Université de Rennes1, Rennes, France

Research Interests: Catalysis driven Organometallic chemistry, 3d Metal Asymmetric catalysis, C-H bond Functionalization, Hydrogenation, Asymmetric catalysis

Professor Basker Sundararaju
Indian Institute of Technology Kanpur,
Kanpur, India.
E-mail: basker@iitk.ac.in

IL-11

3-Membered Aza-Heterocycles; A Versatile Precursor Towards Pharmaceuticals & Value Added Chemicals

Arnab Roy, Subrata Biswas and **Srijit Biswas***
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: sbchem@caluniv.ac.in

Abstract

The ring strain present in 3-Membered Aza-Heterocycles, such as, 2*H*-azirines[1a] and aziridines[1b] renders them as useful precursors in organic synthesis. The regioselective, transition metal-catalyzed ring opening of 2*H*- azirines has been extensively studied for the creation of aza-heterocycles.[1c] Beyond 2*H*- azirines, the regioselective ring expansion of aziridines also facilitates the formation of β-amino functionalized compounds[2] along with the other products, *via* the cleavage of C−N and C−C bonds.[3]

In our research, we developed a Brønsted acid-catalyzed, one-pot synthetic protocol involving the regioselective ring expansion of 2*H*- azirines, enabling the creation of a diverse range of benzofurans,[4] naphthofurans,[4] imidazo[1,2-*a*] pyridines,[5] and imidazo [2,1-*b*] thiazoles.[5] Additionally, the regioselective *O*- and *N*-alkylations of 2-pyridones by 2*H*-azirines were achieved by switching the solvent and catalyst.[6] Furthermore, a variety of amino-ethers and amino-thioethers were synthesized *via* the regioselective ring opening of aziridines under Brønsted acid catalysis, involving C−N bond cleavage, where, the products were subsequently utilized to access several medicinally significant heteroarenes.[2] Beyond C−N bond cleavage, C−C bond cleavage of aziridines has also been utilized to produce novel sulfonamido-substituted oxime-ether analogues by the reaction with aldoximes and ketoximes under Lewis acid catalysis.[3]

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Personal Profile

Dr. Srijit Biswas obtained his Ph.D. in 2011 from Jadavpur University, India, under the guidance of Professor U. Jana. After postdoctoral studies with Professor J. S. M. Samec (2011–2014) at Uppsala University, Sweden, he started his independent career as DST-INSPIRE Faculty (DST, Govt. of India) at the Centre of Bio-Medical Research, Lucknow, India (2014–2018) and as UGC-Assistant Professor (Ministry of Education, Govt. of India) at the Department of Chemistry, University of Calcutta, Kolkata, India (2018–till date).

Awards
Tetrahedron Letters most cited article award
Wenner Gren post-doctoral researcher award
DST-INSPIRE faculty award
UGC-Assistant Professorship with all India Rank 1
SERB-ITS
CSIR-UGC NET JRF and SRF

Dr. Srijit Biswas
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
E-mail: sbchem@caluniv.ac.in

IL-12

Contact-Electrification for Energy Harvesting and Self-Powered Sensors

Sk Masum Nawaz

Department of Electrical and Electronics Engineering, BITS-Pilani, Hyderabad Campus, Karimnagar,
Hyderabad-500078, Telangana, INDIA
E-mail: nawaz.masum@hyderabad.bits-pilani.ac.in

Abstract

Contact-Electrification (CE) or the triboelectric effect, usually introduced in high-school physics course, is a known phenomenon since last 2600 years. Although, CE has always been regarded as a negative effect for electronic circuits and systems, it has been one of the hot areas of research in recent years when the triboelectric nanogenerator (TENG)[a-c], was introduced. TENG, which converts waste mechanical energy to electricity, works on the principle of CE charge transfer (between the layers of two dissimilar triboelectric materials) followed by electrostatic induction of charges on the metal electrodes attached to the triboelectric layers. Hence, an electric field is created between the charged surfaces of the triboelectric layers.[d] If the metal electrodes are connected with external wires, a current will flow through the wires due to time varying surface charge density under mechanical excitation.[e] The power generated by TENG is enough to drive small electronic gadgets, internet-of-thigs (IoT) sensors, etc. TENG has potential to replace batteries from wearable and mobile electronic devices.

Recently, we demonstrated high-performance TENG fabricated by recycling waste-polystyrene (WPS) from waste thermocol packaging boxes.[f] Output performance of this device was further improved by embedding tea-leaf microparticles in WPS.[g] We also demonstrated another performance enhancement method by means of molecular self-assembly of small molecules.[h]Since TENG generates output voltage/current when one triboelectric layer touches other or when the triboelectric surface charge varies, TENG or the CE effect can be utilized as self-powered sensors to detect/monitor a wide range of dynamic systems. We also demonstrated self-powered sensors by employing the CE effect.

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Personal Profile

Dr. Sk Masum Nawaz obtained his Ph.D. in Electronic Science in 2018 from University of Calcutta under the guidance of Prof. Abhijit Mallik. He continued with the same institute as a Postdoctoral Research Associate (2019-2022). Currently he is an Assistant Professor in the Department of Electrical and Electronics Engineering (EEE) of BITS-Pilani (Hyderabad Campus).

Dr. Sk Masum Nawaz
BITS-Pilani, Hyderabad Campus
E-mail: nawaz.masum@hyderabad.bits-pilani.ac.in

IL-13

The novel compounds to combat multiple cancers: Synthesis of 2-acetoxyimidazole derivatives from imidazole N-oxides

Dr. Mossaraf Hossain*
Assistant Professor, Department of UGC-MMTTC (Chemistry), University of North Bengal
Siliguri, Darjeeling-734013, INDIA
E-mail: mossarafchem@nbu.ac.in

Abstract

Synthesis of novel 2-acetoxyimidazole derivative from imidazole N-oxide 1,2 under solvent-free condition in a very short span could be of paramount importance in biological field. In this study we observed selective anticancer activity of at least one such derivative with the help of in-vitro, in-silico and finally in-vivo analysis. After synthesizing a series of 2-acetoxyimidazole derivative we carried out biological efficacies of the compounds. The synthetic drug, 1-benzyl-4,5-dimethyl-1H-imidazol-2-yl acetate, 2h, was found to be differentially toxic on cancer cell lines (MCF 7), compared to normal liver cell line (WRL

68) 3 , evidenced from MTT assay and fluorescence-microscopy based morphological study. In-silico studies further supported that few of the synthesized compounds have satisfied all the criteria of a good drug. The compounds have shown effective binding ability in receptor tyrosine-protein kinase-(ErbB2) cells where the compound (2h) binds strongly up to binding energy -7.2. In-vivo efficacy assay of 2h isoform as anticancer drug was evaluated using female Sprague-Dawley rats treated with a carcinogenic

agent, N-methyl N-nitroso urea (NMU).

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Science and Technology Vol. 2 No. 4; April 2012 c. 5-Fluorouracil induces apoptosis in nutritional deprived hepatocellular carcinoma through mitochondrial damage Ankita Dutta, Anuja Chakraborty, TulikaGhosh & Anoop Kumar; Scientific Reports | (2024) 14:23387

Personal Profile

Dr. Mossaraf Hossain is an Assistant Professor at the UGC-MMTTC (HRDC) at the University of North Bengal, India. Dr. Hossain is also associated with the chemistry department at the University of North. He received his Bachelor's degree (B.Sc honours in chemistry) from Calcutta University and M.Sc from West Bengal State University with organic specialization. He stood first in order of merit of the M.Sc examination, and he was awarded a medal in recognition of his academic excellence. Then, he joined as an Assistant Professor in a substantive post in the department of chemistry at Ananda Chandra College, Jalpaiguri. After a few days, he became an Assistant Professor at the UGC-MMTTC (HRDC), University of North Bengal. He is working on synthetic organic chemistry based on a greener approach and their biological applications. He has been a reviewer of several reputed international journals of the American Chemical Society,Wiley, Elsevier publications, etc. During his PhD, he singly filed a patent on anti-cancer activity containing no side effects, and it was granted by Govt. of India in 2022. Dr

Hossain has published so many novel works in very reputable international journals. Dr. Hossain has received a few research projects from various funding agencies. Presently, four full-time research scholar are continuing their research work under the supervision of Dr. Hossain. Dr. Hossain has delivered so many lectures in various faculty development programmes, Short Term Courses, Refresher Courses, and NEP Orientation & Sensitization programmes conducted by UGC-MMTTC (HRDC) and also various colleges & Universities level.

Dr. Mossaraf Hossain
Assistant Professor, Department of UGC-MMTTC
(Chemistry), University of North Bengal
Siliguri, Darjeeling-734013, INDIA
E-mail: mossarafchem@nbu.ac.in

IL-14

Ru-Catalysis for C-H Activation *vs* Rearrangement: Diverse Array of Functionalized Molecules

Saikat Khamarui, Dilip Kumar Maiti
Department of Chemistry, Govt. General Degree College, Kalna-I, Purba Bardhaman-713405, India
E-mail: saikatkhamarui21@gmail.com

Abstract

An innovative approach to Ru(II)-catalyzed C–H activation, enabling efficient intermolecular cross-dehydrogenative coupling reactions, has been discovered very recently. This method leverages an intrinsic directing group (DG) that facilitates selective functionalization without the need for its installation and deinstallation. The DG undergoes in situ transformation into valuable functional groups, exemplified by the synthesis of complex heterocycles, such as indoles and indenones, through the sequential formation of C–N, C–C, and C–O bonds.[1] On the other hand, the use of the Ru(III)-PhI(OAc)$_2$ reagent combination catalyzes the in situ generation of an isocyanate intermediate from benzimidates, promoting rearrangements to form unsymmetrical ureas and carbamates with high selectivity and yield.[2] These strategies underscore the power of Ru-catalysis for C–H activation and rearrangement, expanding the synthetic toolbox for the rapid construction of valuable and complex molecular structures. Moreover, theseapproaches are highly efficient, selective, and versatile, offering a sustainable pathway for the generation of diverse functional molecules in modern synthetic chemistry.

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Personal Profile

Dr. Saikat Khamarui obtained his Ph.D. in 2015 from the University of Calcutta under the guidance of Professor Dlilip K. Maiti. After doctoral studies he started his independent career as assistant Professor at Govt. General Degree College, Kalna-I, under the University of Burdwan. He is continuing his continuing research works with the collaboration of Prof. D. K. Maiti's laboratory at the University of Calcutta. He has published more than 30 good publications in the reputed journals.

Awards:

- Gold Medalist in Chemistry at the University of Calcutta (2010)
- Young Scientist Award (Acharya Prafulla Chandra Ray Memorial Award) by the Indian Chemical Society (2013)
- *CrystEngComm* Best Poster Prize at the International Conference on Structural Chemistry of Molecules and Materials (SCOMM-2014), Royal Society of Chemistry (2014)
- Best Poster Award at the International Conference on Chemistry for Human Development (ICCHD-2018) from the Professor Asima Chatterjee Foundation, Kolkata (2018)
- Best Lecture Award at the International Conference on Chemistry for Human Development (ICCHD-2020) from the Professor Asima Chatterjee Foundation, Kolkata (2020)

Dr. Saikat Khamarui
Govt. General Degree College, Kalna-I
Purba Bardhaman-713405, India
E-mail: saikatkhamarui21@gmail.com

IL-15

A Versatile Step-Growth Polymerization Route to Enzymatically Degradable Functional Polyesters and Their Biomedical Implications

S. Biswas, R. Barman, M. Biswas, A. Banerjee, P. Rajdev and **Anindita Das***

School of Applied and Interdisciplinary Sciences, Indian Association for the Cultivation of Science, 2A and 2B Raja S. C. Mullick Road, Jadavpur, Kolkata 700032, INDIA. E-mail: psuad2@iacs.res.in

Abstract

Our work describes a versatile and efficient step-growth polymerization route to functional aliphatic polyesters through an organo-catalyzed transesterification reaction between an activated pentafluorophenyl-diester of adipic acid (AA) and various structurally different diols (BB) (Scheme 1).[1] The use of an activated diester enables us to obtain a near quantitative reaction under mild conditions with no requirement of by-product (pentafluorophenol) removal, which remains a major drawback in the conventional polyester synthesis with non-activated diesters. Enzymatic degradation of the resultant polyesters has been demonstrated, which can be tuned by playing with the hydrophobicity of the polyester backbone. Following the same synthetic strategy, water dispersible amphiphilic, cationic polyesters with pendant naphthalene monoimide (NMI) derivatives were prepared by pre-quaternization of the fluorescent monomers with different alkyl chain ends in order to design polyesters with positively charged hydrophobic pendant moieties. These amphiphilic polyesters produced fluorescent nanoparticles in water, which exhibit broad-spectrum antibiotic properties against both gram-positive and gram-negative bacteria depending upon the nature of the cationic side chains.[2] The intrinsic fluorescent nature of the nanoparticles enabled us to study their interactions with bacterial cells by fluorescence live-dead assay, which provided us insights of bacterial disruption by membrane perturbation similar to the mechanism followed by host defense peptides. The facile synthetic methodology enables us to investigate systematic structure-activity relationships in such rarely reported dye-conjugated polyester backbones, which suggests the dual role of the aliphatic chain and the aromatic dyes in conferring biocidal activity, selectively against the bacterial cells. Some of these cationic polyesters exhibit remarkably high cellular uptake by the endocytic pathway and mitochondrial targeting ability following lysosomal escape.[3] Further, this methodology enables us to design and prepare biotin-functionalized polyesters that exhibit selective uptake in cancer cells, thus showing their potential for targeted drug delivery applications.[4] This presentation will showcase multiple aspects of our newly established synthetic methodology for functional polyesters and their biomedical implications..

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3. S. Biswas, P. Rajdev, A. Banerjee and A. Das (*Manuscript submitted)*
4. S. Biswas, P. Rajdev, A. Banerjee and A. Das (*Manuscript under preparation)*

Personal Profile

Anindita Das received her Ph.D. degree from the Indian Association for the Cultivation of Science (IACS), Kolkata, India, in 2014 under the supervision of Professor Suhrit Ghosh. Subsequently, she worked as an Alexander von Humboldt Postdoctoral Fellow with Professor Patrick Théato at the University of Hamburg, Germany, during 2014–2016. In 2016, she joined the group of Professor E. W. Meijer at the Eindhoven University of Technology, The Netherlands, for a second postdoctoral stint. In 2017, she joined IACS as a Faculty Fellow, where she is currently holding the position of Associate Professor in the School of Applied and Interdisciplinary Sciences. Her research interests include supramolecular polymerization of functional π-systems and macromolecules by directional non-covalent interactions, crystallization-driven macromolecular assemblies, and degradable polymers.

- Kabita Maiti Memorial Award (2024) conferred by
- Prof. Sukumar Maiti Polymer Award Foundation
- ACES-CRSI Young Scientist Award (2024)
- SERB Women Excellence Research Grant (2024)
- Associate Fellow of the Indian National Science Academy (2023)
- Associate of the Indian Academy of Sciences (2022)
- DAE-BRNS Young Scientist Research Award (2022)
- Author’s Profile Published in *Angewandte Chemie* (2022)
- Advisory Board Member of RSC Applied Polymers since 2024
- Early Career Advisory Board Member of the Journal *ChemNanoMat* since 2022Editorial Board Member of the J*ournal of Macromolecular Science, Part A: Pure and Applied Chemistry* since 2022
- Alexander von Humboldt Postdoctoral Fellowship (2014)

Anindita Das
Indian Association for the Cultivation of
Science, 2A and 2B Raja S. C. Mullick
Road, Jadavpur, Kolkata 700032, INDIA

IL-16

Oxygen: a reagent to generate air stable carbon centered radicals

Kalyan K. Sadhu
Department of Chemistry, Indian Institute of Technology Roorkee, Roorkee-247667, INDIA
E-mail: sadhu@cy.iitr.ac.in

Abstract

The conventional key steps for dicyanomethyl radical synthesis involved potassium ferricyanide, DDQ or lead(IV) oxide reagents.[1-3] In the last decade Hayashi et al. demonstrated drawbacks of the stability of the dicyanomethyl radical during oxygen mediated oxidation.[4] In this decade, Tang's group have only showed the oxidation of pyrrole ring to radical cation in the presence of oxygen.[5] Combination of organic small molecule and AuNP study[6] opened the possibility of cationic fluorophores in the sensing studies. Organic cationic fluorophores have been recently developed by us from organic radical, which has been obtained from oxygen mediated synthesis.[7] We are currently working on low molecular gelator[8] based application of these small molecules in radical trapping and bioimaging.

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M. Kulshrestha, C. N. Ramachandran, R. G. Gonnade, K. K. Sadhu, *Mater. Adv.* **2024**, *5*, 1523.
M. A. Sk, R. Kyarikwal, K. K. Sadhu, *ACS Appl. Bio Mater.* **2024**, *7*, 6950.

Personal Profile

Dr. Kalyan K. Sadhu obtained his Ph.D. in 2010 from IIT Kanpur, India under the guidance of Professor Parimal K. Bharadwaj. After postdoctoral studies with Professor Kazuya Kikuchi at Osaka University, Japan (2009-2011) and with Prof. Nicolas Winssinger at Strasbourg University, France and University of Geneva in Switzerland, he started his independent career IIT Roorkee since 2014. He became Associate Professor at same institute in 2020. He is working in Nanobio Interfacial Chemistry. His group is working on gold nano- and supra-architectures for biological applications such as imaging, recognition and drug delivery. For the sensing studies with gold nanomaterials, they use small organic molecules. They have recently started working on highly reactive oxygen for synthesizing emissive and air stable small organic radicals.
Visiting Professorships at Technical University Munich (Munich, Germany, 2022).
Award:Institute Research Fellowship, IIT Roorkee 2020-2023

Dr. Kalyan K. Sadhu
Department of Chemistry,
Indian Institute of Technology
Roorkee, Roorkee-247667, India.
E-mail: sadhu@cy.iitr.ac.in

IL-17

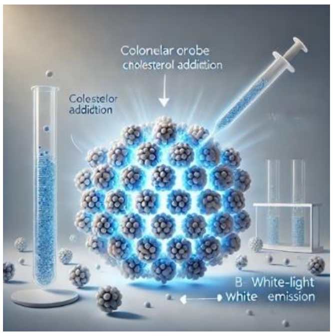
Nanotechnology-Assisted Detection of Blood Cholesterol and White-Light Emission in Aqueous Solutions

Sukhvinder Dhiman, Sarita Kumari and **Govindasamy Jayamurugan***

Institute of Nano Science and Technology (INST), Sector 81, Mohali, Punjab 140306, INDIA
E-mail: jayamurugan@inst.ac.in

Abstract

Cholesterol imbalance, including both hypo- and hyper-cholesterolemia, serves as a vital biomarker for a wide range of cardiovascular and metabolic disorders.[1a] The development of affordable, accurate, and user-friendly diagnostic tools is critical for early detection and effective disease management. This presentation introduces an innovative diagnostic platform based on an organic small-molecule fluorescent probe designed specifically for the detection of blood cholesterol. By harnessing nanotechnology, this approach achieves a highly sensitive and selective assay capable of quantifying cholesterol levels in biological samples. The patented probe[1b] demonstrates remarkable fluorescence response over a broad cholesterol concentration range. Furthermore, the supramolecular self-assembly of the probe into nanovesicles enables white-light emission in aqueous environments, unlocking potential for multiplexed diagnostics and advanced imaging applications.[1c,d]This talk will delve into the molecular design, photophysical mechanisms, and functional principles of this groundbreaking probe, supported by recent findings from peer-reviewed publications. We will also discuss its practical implications, including integration into point-of-care diagnostic devices and prospects for real-time cholesterol monitoring.This work underscores the transformative impact of nanotechnology-driven innovations in biomedical research, paving the way for next-generation solutions in diagnostics and healthcare.



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Personal Profile

Professor Jayamurugan graduated from the University of Madras with a M.Sc in Organic Chemistry (2003). He then completed his PhD in Organic Chemistry at Indian Institute of Science (2009), Bangalore, under the supervision of Prof. N. Jayaraman. After postdoctoral studies at ETH Zurich with Prof. François Diederich and at the Department of Chemistry, University of Cambridge with Prof. Jonathan Nitschke, he joined Institute of Nano Science and Technology, Mohali as an Assistant Professor in 2015 and was promoted to Associate Professor and Professor in 2020 and 2024, respectively. His research interests are in functional organic nanomaterials for energy, environment, and health-related applications. He has published in several top ranked journals and is also serving as a reviewer of several journals.

Awards

Ramanujan fellowship

SERB-Early career research award

IOP journal’s upcoming Emerging Leaders 2024 collection issue in the area of Nano Science and Technology

Govindasamy Jayamurugan
Institute of Nano Science and Technology (INST),
Sector 81, Mohali, Punjab 140306, INDIA
E-mail: jayamurugan@inst.ac.in

IL-18

Biodegradable Polymers and Copolymers

Debashis Chakraborty*
Organometallics & Polymer Chemistry Lab, Department of Chemistry, Indian Institute of Technology Madras,
Chennai-600036, Tamil Nadu, INDIA
E-mail: dchakraborty@iitm.ac.in

Abstract

In recent years, a substantial amount of research has resulted in the genesis of new sustainable technologies towards the manufacture of polymers derived from renewable sources. The major reason for such a heuristic approach stems from the pollution problems associated with conventional plastics. 1 One such biodegradable material that has attracted increasing attention is poly(lactic acid) (PLA) which is commercially produced using the ring-opening polymerization (ROP) of lactide (LA).This methodology allows better control over molecular parameters (polydispersity index, molecular weight) under mild reaction conditions.[1] A study by Tolman et al. found that the stereoselectivity present in PLA is a result of thermodynamic preference of the initiating monomer molecule from a racemic mixture of LA enantiomers.[2] It is now beginning to unravel that an unsymmetrical transition state produced from LA and the catalyst during the initiation step plays a key role in deciding the stereospecificity of the propagation step, ultimately governing the final stereochemistry of the PLA, in addition to the thermodynamic preference for its molecular parameters. Jones et al. reported a Zr-meso salan complex, which is capable of producing an isotactic enriched PLA.[3] Recently, Kol et al. prepared an enantiopure salan magnesium complex which produces isotactic enriched PLA.[4] Earlier, we had reported benzotriazole phenoxide group (IV) complexes which are capable of producing highly heterotactic PLA.[5] However, the existing literature pays little attention towards the study of the symmetry of the transition state during initiation in LA polymerization. Thus, one of our objectives is an understanding towards the control of the molecular parameter as well as the tacticity of the PLA which is anticipated to depend on symmetry of the transition state. This was surmised to be solved either by using non-centrosymmetric ligand frameworks in the catalyst, or by using an enantiopure ligand. Our results proved the concept. [6, 7] In addition, this lecture shall cover the important aspects of our research towards the synthesis of sustainable copolymers. [8-10]

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Personal Profile

Prof. Debashis Chakraborty received his PhD degree in 2000 from the University of Gŏttingen, Germany, under Professor Dr.h.c.mult Herbert W. Roesky. He started his post-doctoral work onfluorine chemistry at the university of Idaho. About a yearlater, he moved to Colorado state university and the Dow chemical company in a joint postdoctoral research associate position.With respect to his career history, in 2003 he returned to India and joined two multinational pharmaceutical companies as a corporate research Group Leader before joining the Dept. of Chemistry of the Indian Institute of Technology Madras in 2005. Currently, he heads the Organometallics and Polymer Chemistry group. Some specific areas of research this group focuses on are organometallics for biopolymer synthesis, homogenous catalysis, carbon dioxide utilization, waste to wealth technology and water activation.Prof. Chakraborty had already published more than 100 research papers in various esteemed international journals and has over 16 active patents. He has been awarded the Associate Fellow of the Institution of Chemical Engineers UK (AFIChemE), Fellow of the International Association of Advanced Materials Sweden (FIAAM), Fellow of the Science Frontier Research Council UK (FSFRC) and Life Fellow of the Indian Chemical Society (FICS). His excellent public services have also been rewarded and features in the 33rd Edition of Marquis Who's Who in the World publication. Prof. Debashis Chakraborty has professional registration with the Science Council (UK) and is a professional member of Institute of Science & Technology (UK) (MIScT) with Chartered Scientist (CSci) status.

Debashis Chakraborty
Organometallics & Polymer Chemistry Lab,
Department of Chemistry, Indian Institute of
Technology Madras,
Chennai-600036, Tamil Nadu, INDIA
E-mail: dchakraborty@iitm.ac.in

IL-19

NDI-Based Soft Materials Exhibiting High Performance and Tunable Electrical Properties Through Side Chain Engineering

Shamim Ahamed, Nargis Khatun, A K M Maidul Islam, Muklesur Rahman, and **Tapas Ghosh***
Department of Chemistry, Jadavpur University, 188, Raja Subodh Chandra Mallick Rd., Kolkata-700032, INDIA
E-mail: tapasg.chemistry@jadavpuruniversity.in

Abstrcat

Naphthalenediimide (NDI) has garnered significant attention in research due to its remarkable electronic properties and versatility over several decades. It's a potent electron acceptor with a high electron affinity, which makes it an excellent candidate for organic electronics. Its ability to accept electrons efficiently proved its worth in the field of organic electronics, including organic photovoltaic cells (OPVs), solar cells along with materials having high charge mobility and semiconducting polymers.[1a-e] Moreover, the NDI core can easily be functionalized with various substituents in different positions, allowing tailoring its properties for specific applications. This versatility has led to the development of a wide range of NDI-based materials with different electronic, optical, and structural characteristics.[1f] Amino substitution, in particular, in core of naphthalenediimide (NDI) compounds is a powerful strategy that enhanced their utility in various materials and biological applications.[1g] Recently, we found that accommodating amine substituents on electron-poor NDI scaffold yielded notable electronic characteristics of interest. These aminated NDI-based compounds exhibited two distinct absorption bands: one at a high-energy band (350–450 nm) associated with π–π^* transitions and the other one (450–600 nm) due to intramolecular charge transfer (ICT) absorption. The obtained band gaps, ranging from 2.8 to 3.45 eV depending on side chain modifications, demonstrated tunability, indicating varied semiconducting properties. Electrical studies revealed that all the side chain-modified molecules exhibited high electrical conductivity and displayed characteristics of Schottky diodes. Different Schottky parameters were found to vary based on side chain engineering, aligning well with their optical characteristics and indicating a tunable electrical nature linked to molecular design.

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Personal Profile

Dr. Ghosh obtained his Ph.D. in 2013 from University of Kalyani, West Bengal, India under the guidance of Professor K. C. Majumdar. After postdoctoral studies with Professor Levent Artok at Izmir Institute of Technology, Turkey (2014), Professor Okiko Miyata, Kobe Pharmaceutical University, Japan (2014-15) and Professor Matthias Lehmann, University of Würzburg, Germany as Alexander von Humboldt Fellow (2015-17), he started his independent career as an Assistant professor in Sree Chaitanya College, Habra, West Bengal in 2017. In 2018, he moved as an Assistant Professor in the Department of Natural Sciences, Maulana Abul Kalam Azad University of Technology (MAKAUT), West Bengal, India. Since, August 2022, he has been working as an Assistant Professor in the Department of Chemistry (Organic Chemistry Section), Jadavpur University, Kolkata, India. Dr. Ghosh has more than 50 international publications in reputed journals. His research interest includes the development of new synthetic methodologies to design and synthesis of small drug molecules of biological relevance along with the application of advanced functional materials in organic photovoltaics (OPV).

Awards

- SERB-TARE Fellowship, SERB, India. (2024)
- ACS Best Oral Presentation award at ICCHD, Kolkata, 2020. (2020)
- Alexander von Humboldt Postdoctoral fellowship, Alexander von Humboldt Foundation, Germany. (2015)
- BELSPO Postdoctoral fellowship, Govt. of Belgium. (2015)
- Marie-Skłodowska-Curie actions Postdoctoral fellowship (H2020-MSCA-IF-2014). (2014)
- KPU Postdoctoral fellowship by Kobe Pharmaceutical University, Japan. (2014)
- TÜBITAK Postdoctoral fellowship, Turkey. (2014)

Tapas Ghosh
Department of Chemistry, Jadavpur University, 188, Raja Subodh Chandra Mallick Rd., Kolkata-700032, INDIA
E-mail: tapasg.chemistry@jadavpuruniversity.in

IL-20

Unraveling Novel Mechanisms Targeting β-Lactam Antibiotics: Crystallographic Revelations Shaping the Atomistic Blueprint for Next-Generation Diagnostics Against Antimicrobial Resistance (AMR)

Saugata Hazra
Department of BSBE, Center of Nanotechnology, Indian Institute of Technology, Roorkee
E-mail: saugata.hazra@bt.iitr.ac.in, saugata.iitk@gmail.comn

Abstrcat

SME-1, a Class A carbapenemase, stands as a formidable adversary in the escalating battle against antibiotic resistance, particularly within Serratia species. Celebrated for its alarming proficiency in hydrolyzing all β-lactams—including carbapenems, the last bastion of defense—SME-1's mechanism remains shrouded in mystery, despite structural parallels with other Class A β-lactamases. This study delves into four pivotal aspects of SME-1's biochemical intricacies: (a) subtle nuances of antibiotic-enzyme interactions, (b) the potential of novel chemical moieties for antibiotic innovation, (c) the assessment of advanced "smart" molecules as antibiotic contenders, and (d) a groundbreaking mechanism for cephalosporin side-chain release.

To unravel these complexities, we determined high-resolution crystal structures (1.4–2.6 Å) of SME-1 in complexes with six clinically crucial carbapenems, five diazabicyclooctanes (DBOs), one 6-Methylidene Penem, and six cephalosporins. Using both the wild-type enzyme and an E166A deacylation-deficient mutant, we illuminated intricate substrate interactions. Complementary kinetic analyses via colorimetric assays and thermodynamic insights through isothermal titration calorimetry (ITC) further bolstered these findings, unveiling the dynamic intricacies of SME-1's catalytic machinery.

Our discoveries reveal critical molecular vulnerabilities in β-lactamase enzymes, offering a blueprint for developing next-generation antibiotics. Beyond therapeutics, this work emphasizes the urgency of diagnostics in combating antimicrobial resistance—where swift detection often outweighs treatment in importance. Notably, we developed a groundbreaking series of diagnostic devices: BL-Tester, Competitive BL-Tester, Environmental BL-Tester, Advanced BL-Tester, and the cutting-edge SRET-based BL-Tester. These innovations hold the potential to revolutionize AMR diagnostics and treatment, transforming the global fight against this relentless health challenge.

Personal Profile

Professor Saugata Hazra embarked on his academic journey with a Ph.D. from the University of Illinois, Chicago, USA, in 2010, under the esteemed mentorship of Professor Arnon Lavie. Following this, he pursued postdoctoral research with Professor John Blanchard at Albert Einstein College of Medicine (2011–2014). His academic career began as an Assistant Professor at the Indian Institute of Technology (IIT) Roorkee. Subsequently, he held professorial positions at Marburg University and Stuttgart University, where he served as an Associate Professor. Currently, he is an Associate Professor in the Department of Biosciences and Bioengineering (BSBE) at IIT Roorkee and a Joint Faculty member at the Center of Nanotechnology.

Awards and Recognitions:

- GEMS Graduate Fellowship
- Young Scientist Research Award
- Frontiers in Bioscience by the Royal Academy of Engineering, UK

Professor Hazra's distinguished career reflects his unwavering commitment to advancing field of enzymology against targets critical for antibacterial resistance, coupled with his impactful contributions to India Combating Against Bacterial Resistance (ICABR).

Prof. Saugata Hazra,
IIT Roorkee, India

IL-21

Pharmacopeial Standardization of Homoeopathic medicines in India: The present practice and potential future development

Satyaji Maity, Paulami Majumdar, Sudeshna Sett, and **Bibaswan Biswas***
Drug Standardization – Chemistry, Dr. Anjali Chatterji Regional Research Institute for Homoeopathy, CCRH, MoA, Government of India Kolkata-35
E-mail: bibaswanbiswas@ccrhindia.nic.in

Abstract

The cornerstone of a high-quality healthcare system lies in its quality of the medical products, with a particular emphasis on the quality of the administered medicines. Pharmacopoeias play a pivotal role in encompassing the regulatory standards thereby ensuring the consistent high-quality medicines in the market. Such authoritative standards in regulatory compliance system ensure safety and efficacy of the market medicines. For Homoeopathic medicines in India, Homoeopathic Pharmacopoeia of India (HPI) serves as the statutory and authoritative reference for ensuring regulatory compliance. In HPI currently the monographs of the drugs contain certain physicochemical and chemical parameters for both the raw drug (starting materials, e.g., plant parts, chemicals, minerals, and animal tissues, etc.) and the homoeopathic medicines/tinctures (mother tinctures). The monographs also provide direction about the preparation of the mother tincture. The physicochemical/chemical parameters include moisture content, ash values, soluble extractives in different solvents (water, ethanol, hexane), volatile and fixed oil content, heavy metal, pesticide, aflatoxin, and microbial contamination concentration. Once a raw drug sample meets all the regulatory criteria, the mother tincture is prepared from that raw drug sample. After the preparation of the raw drugs as per HPI, the prepared tinctures are then subjected to pH tests, qualitative and quantitative phytochemical screening, and advanced analytical techniques such as High-Performance Thin-Layer Chromatography (HPTLC) and High-Performance Liquid Chromatography (HPLC) involving chemical fingerprinting. Presently, our primary objective to provide the experimental values of the aforesaid parameters which HPI lacks. Beyond developing pharmacopeial standards, we frequently analyze commercial tinctures, including those imported from abroad. Through quality testing on mother tinctures of Justicia adhatoda, Damiana, Yucca filamentosa, and Apis mellifica etc, we identify and address issues that could compromise the safety or effectiveness of these products. By resolving these quality issues, we help to prevent possible Adverse Drug Reactions (ADRs), contributing to the overall protection of public health. Recently, beyond the structured pharmacopeial study we started exploring *homoeopathy specific* active marker compounds through experimental and computational study.

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Personal Profile

Dr. Bibaswan Biswas, born in West Bengal, India in 1985 received his B.Sc. and M.Sc. in Chemistry from University of Calcutta. He had his doctoral study at Texas A&M University under the supervision of Dr. Daniel A. Singleton and received his PhD in 2015 with the highest grades. After completion of his PhD, he joined as a post-doctoral fellow at Dr. M. P. Watson's group at University of Delaware, in 2015 under a National Institutes of Health (NIH) project. In 2017, he joined as Research Officer (Chemistry), CCRH/Scientist-1. He is presently working as a Scientist-2. In CCRH his main focus of research in the field of pharmacopoeial standardization of homoeopathic drugs. Besides these, he is one of the Principal Members of the Bureau of Indian Standards (BIS), formerly known as ISI of the Homoepathy subcommittee. Under the mentorship of the committee, the BIS publishes standards for the homoeopathic products.

Dr. Bibaswan Biswas
Drug Standardization – Chemistry, Dr. Anjali Chatterji Regional Research Institute for Homoeopathy, CCRH, MoA, Government of India Kolkata-35
E-mail: bibaswanbiswas@ccrhindia.nic.in

IL-22

Polymer Based Smart Nanoassemblies For Cancer Cell Selective Drug Delivery Applications

Arun Mondal, Soumya Kolay, Subrata Santra, Sananda Dey, Biplab Giri and **Mijanur R. Molla***

Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India
E-mail: mrmchem@caluniv.ac.in

Abstract

A dynamic covalent poly(disulfide)s based cross-linked nanoassemblies endowed with pH and redox responsive degradation features has been prepared for stable non-covalent encapsulation and triggered guest release in a controlled manner. The bio-derived lipoic acid based amphiphiphilic molecule self-assembles by entropy driven self-assembly process in aqueous solution.[a-c] To further stabilize the self-assembled nano-assembly, the core was cross-linked by ring opening polymerization of lipoic acid attached with the amphiphilic molecule. The cross-linked nanoassemblies is found to be stable in blood serum and also it maintains self-assembled structure even below its critical micellar concentration (CMC) as demonstrated by DLS experiments.[d-e] The cross-linked polymeric nanoassemblies showed significant reduction in guest leakage compared to uncross-linked one as shown by release profile in absence of stimuli, indicating high encapsulation stability as evidenced by FRET experiment. The biological evaluation revealed that doxorubicin loaded cross-linked nanoassemblies (CNs-DOX) are nontoxic to normal cells, but in contrast, showed a robust apoptotic effect on cancer cells indicating excellent specificity. Thus, the fabrication reproducibility, robust stability, triggered drug release and cell selective toxicity behavior makes this cross-linked polymeric system very promising in the field of chemotherapeutic applications.

The details synthesis, self-assembly, fabrication and biological evaluation will be the topic of the presentation.

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Personal Profile

Dr. Mijanur Rahaman Molla received M. Sc. degree in Chemistry from the University of Calcutta, India in 2008 and subsequently joined Indian Association for the Cultivation of Science, Kolkata, India as a PhD student under the supervision of Dr. Suhrit Ghosh. He graduated in 2013. Then he moved to the University of Massachusetts, Amherst, USA where he completed two years of postdoctoral study on biologically relevant polymer assemblies in the group of Prof. Thayumanavan. He then joined as Alexander von Humboldt postdoctoral fellow in the group of Prof. Pavel Levkin at Karlsruhe Institute of Technology, Karlsruhe, Germany as a postdoctoral fellow. Since December, 2016 he has joined as Assistant Professor in the Department of Chemistry, University of Calcutta, Kolkata, India.

Fellowship and Awards:

Elected Associates of West Bengal Academy of Science and Technology (June, 2023)
JMS-PAC Early Career Research Award from Taylor & Francis (March, 2023)
S. S. Bhatnagar Young Scientist Award, Indian Chemical Society, India (2020)
Early Carrier Research Award, DST-SERB, India (2019)
Alexander von Humboldt Postdoctoral Award, Germany (2016)
Sir P C Ray Research Award, University of Calcutta, India (2014)

Dr. Mijanur Rahaman Molla
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India.
E-mail: mrmchem@caluniv.ac.in
.

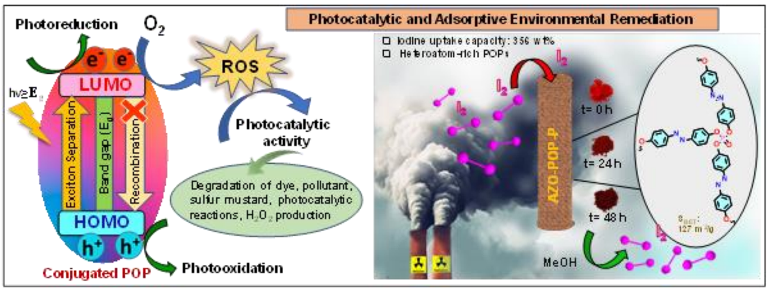
IL-23

Conjugated and Non-conjugated Porous Organic Polymers in Sustainable Photocatalytic and Adsorptive Environmental Remediation

Suman Kalyan Samanta, Flora Banerjee, Soumitra Sau, Sudharanjan Bera & Krishnendu Maity
Department of Chemistry, Indian Institute of Technology Kharagpur, Kharagpur 721302, India
Email: sksamanta@chem.iitkgp.ac.in

Abstract

Adsorptive and photocatalytic degradation removal are the most effective ways for pollution abatement treatments for environmental remediation. Heteroatom-rich porous organic polymers (POPs) show efficient uptake of various dyes, industrial waste, toxic micropollutants, as well as radioactive iodine. We revealed that -OH rich, BINOL-based POPs are excellent in selective adsorption of cationic dyes and micropollutants.[1] Interestingly, spirobifluorene-linked BINOL-based POPs showed excellent iodine uptake in vapour phase (4.0 $g.g^{-1}$) with facile charge transfer interactions.[2] Meanwhile, our recent investigations revealed that heteroatom-rich POPs showed high iodine uptake from vapor and solution phases that include amide-linked *cis*,*cis*-1,3,5-cyclohexanetricarbonyl-based POPs (up to 3.53 $g.g^{-1}$),[3] and phosphate-based POPs (up to 3.56 $g.g^{-1}$).[4] However, compared to adsorptive removal, photocatalytic degradation of toxic micropollutants has innate advantages, particularly converting them into non-toxic, value-added byproducts. Conjugated porous polymers are photoactive, and upon light exposure, they generate electrons/holes and various reactive oxygen species. We successfully demonstrated that TPA-anthracene-based POPs can selectively detect nitroaromatic micropollutants or dyes and simultaneously photodegrade them in water.[5] Quinoid-locked dyes in porous polymers can degrade sulfur mustards photocatalytically.[6] Interestingly, for the first time, we showed that BINOL-based POPs can photosynthesize large amounts of H_2O_2 and degrade various micropollutants.[7]



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Personal Profile

Suman Kalyan Samanta was born in West Bengal, India, in 1983. He received his B.Sc. (2004) and M.Sc. (2006) in Chemistry from the University of Calcutta. He obtained his Ph.D. in 2011 from the Indian Institute of Science under the tutelage of Prof. Santanu Bhattacharya. In 2013, he joined Prof. Ullrich Scherf's group at Bergische Universität Wuppertal, Germany, as Alexander von Humboldt fellow for his postdoctoral studies on conjugated polymer and polymer network synthesis. He completed his second postdoc in the group of Prof. Joon Hak Oh at the Pohang University of Science and Technology (POSTECH), South Korea, in optoelectronic device applications of organic materials (small molecules and conjugated polymers) for field-effect transistors, organic solar cells and light-emitting diodes. His research interests include design, synthesis, and characterization of chromophoric functional organic molecules, conjugated polymers, porous polymer networks, supramolecular chemistry, and optoelectronic device applications. He has co-authored more than 45 peer-reviewed international journals. He has received prestigious awards including Gold medal in MSc, Best Thesis Award (The Guha Research Medal) in Ph.D. and Alexander von Humboldt Fellowship (Germany) in postdoc.

Dr. Suman Kalyan Samanta
Department of Chemistry, Indian Institute of Technology
Kharagpur, Kharagpur 721302, India.
Email: sksamanta@chem.iitkgp.ac.in

IL-24

Assembling a New Generation Smart Materials with Supramolecular Approaches

Amitava Mandal

Molecular Complexity Laboratory, Department of Chemistry, Raiganj University, Raiganj, West Bengal, India, Pin: 733134
E-mail: amitavanbu@gmail.com

Abstract

Molecular self-assembly is prevalent in chemistry, biology, and materials science, having been present long before it evolved into a separate field of modern research.[1] In supramolecular chemistry, self-assembly describes the process in which smaller, simpler subunits with complementary functions spontaneously come together to create more complex supramolecular structures.[2] Cyclodextrin (CD)-based supramolecular chemistry is a rapidly growing field in modern chemical research, offering greater complexity than individual components. These supramolecules show immense potential for use in applications such as molecular devices, sensors, artificial ion channels, on-off scaffolds, and beyond.[3,4] Meanwhile, in contrast to molecular chirality, supramolecular chirality is closely connected to the self-assembly of chiral or achiral building blocks, resulting in the creation of chiral superstructures that span from nanometer-sized organic molecules to helical fibers.[5] A deep understanding of the structure-property relationship between the self-aggregation of achiral building blocks and their resulting chiroptical properties would greatly aid in the design and development of emerging chiroptical materials.[6] In some cases, these self-assembled systems exhibit responsiveness to external stimuli, a characteristic closely linked to the evolution of life.

To this context, we have designed octyl-2-acetoxybenzoate (OCASP) which spontaneously self-assembled into a thermoresponsive nanotubular architecture with β-cyclodextrin (β-CD). With N-dodecylpyridinium (DCP) we have developed nanosheets and/or two-dimensional lamellae. We also developed chiral J-aggregated hierarchical nano-structure which showed promising fluorescence properties. In another approach we have designed a supramolecular bio-sensor by synthesizing thioglycolated-β-CD anchored silver nanoparticles as a potential receptor that could easily recognise L-cystine in urine to diagnose cystinuria.

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Personal Profile

Dr. Amitava Mandal obtained his Ph.D. in organic chemistry in 2012 from University of North Bengal, India under the guidance Prof. Dr. Pranab Ghosh. After post-doctoral studies (2014) with Prof. Dr. Kimmon Kim at the Institute of Basic Sciences (IBS) in POSTECH, Pohang, South Korea, Dr. Mandal started his independent career at the Department of Chemistry, Raiganj University, West Bengal, India. He is also the recipient of Dr. D. S. Kothari Post Doctoral fellowship (2015). He is the visiting professor at the Department of Chemistry, University of Gour Banga, West Bengal, India.

Amitava Mandal
Molecular Complexity Laboratory,
Department of Chemistry, Raiganj
University, Raiganj, West Bengal, India,
Pin: 733134

IL-25

Utilizing Renewable Energy to Functionalize $C(sp^2)$-H Bond for the Synthesis of Value-Added Compounds

Sudipta Raha Roy
Indian Institute of Technology Delhi, New Delhi
Email: srr@chemisry.iitd.ac.in

Abstract

Functionalization of C-H bonds owing to the large kinetic barrier associated with its bond cleavage has always been most dynamic topics to synthetic chemists.[1] Tremendous advancements have been done in the field of metal catalyzed C-H bond functionalization to achieve diverse functionalities.[2] These viable strategies offer great opportunities for the synthesis of pharmaceutically relevant molecules, agrochemicals, natural products and complex molecular scaffolds.[3] The classical methods mainly rely on utilization of pre-activated precursors for both reactivity as well as selectivity. However, the requirement for installation of an activating group prior to transformation adds cost to the synthetic route and leads to production of unwanted byproducts. Therefore, development of more atom and step-economical methodologies for direct C-H functionalization without any pre-activation of starting material is highly desirable.

As a part of our ongoing interest on the functionalization of C-H bonds[4], how the readily available and cost-effective building-blocks can be utilized to functionalize $C(sp^2)$-H bond in the presence of light and electricity will be discussed in this lecture.

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Personal Profile

Dr. Sudipta Raha Roy earned his PhD from NIPER-Mohali under the supervision of Prof. Asit K. Chakraborti. Dr. Raha Roy joined the group of Prof. Ilan Marek at Technion, Israel as a PBC postdoctoral fellow. He further continued his postdoctoral studies with Prof. Paolo Melchiorre at ICIQ, Spain as a Marie Curie postdoctoral fellow. In November 2018, Dr. Raha Roy joined the Indian Institute of Technology Delhi as an Assistant Professor in the Department of Chemistry and subsequently promoted to Associate Professor in March 2023. His current research interests concern the discovery and development of sustainable catalysis for small molecule activation.

Sudipta Raha Roy
Associate Professor
Indian Institute of Technology Delhi, New Delhi
Email: srr@chemisry.iitd.ac.in

IL-26

IL-27

Semiconducting Behavior of Organic Cocrystal Driven by the Proton Coupled Charge Transfer Through H-bonding

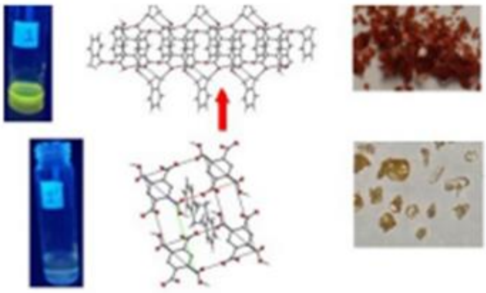
Sushobhan Ghosh

Department of Chemistry, Alipurduar University , Alipurduar -736122; Westbengal, INDIA

e-mail: sushobhan.iisc@gmail.com

Abstract:

The construction of organic material with important electrical properties is demonstrated where the charge transfer state is generated via delocalization through H-bonding interaction pathway[a]. The reaction of simple organic carboxylic acids with diamines generates the purely nonconducting organic salts which eventually transform into semiconducting materials via extended charge transfer through H-bonding1 . The rare transition phenomena of a particular colorless cocrystal to an orange charge transfer state is demonstrated by clear differentiation by cyclic voltametry, spectroscopy and electrical conductance study which states the first example of formation of donor acceptor based charge transfer material constructed by just tuning the H-bond distance of a colorless cocrystalline state with non chalcogen and non halogenated molecules. The semiconducting behavior of the H-bonded cocrystalline systems are studied thoroughly[b] and the origin of electrical conductivity are demonstrated3 as a proton coupled electron transfer through the charge assisted H-bond[c].



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Personal Profile

Dr. Sushobhan Ghosh obtained his Ph.D. in 2009 from IISc under the guidance of Professor Partha Sarathi Mukherjee. After postdoctoral studies with Professor Ramon Vilar at Imperial College London (2011-2013) and Prof. Franc Meyer at University of Goettingen (2013-2015) he started his independent career as UGC Assistant Professor at Gauhati University (2015-2020). Later he moved to Alipurduar University in Westbengal, India where he is currently serving as an Assistant Professor in the Department of Chemistry.

Awards:

Alexander Von Humboldt Fellowship
Royal Society Newton Fellowship
Young Scientist Medal from IAAM

Sushobhan Ghosh
Department of Chemistry, Alipurduar University ,
Alipurduar -736122; Westbengal, INDIA
E-mail: sushobhan.iisc@gmail.com

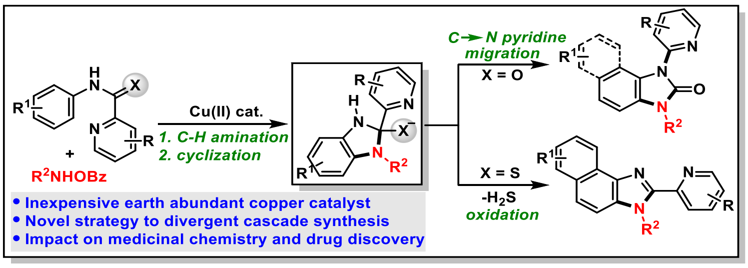
IL-28

Molecular Diversity via Switchable 1,2-Shift in C-H Activation Cascade

Ranjan Jana
Organic and Medicinal Chemistry Division, CSIR-Indian Institute of Chemical Biology, 4 Raja S C Mullick Road, Jadavpur, Kolkata-700032,
Email: rjana@iicb.res.in

Abstract

Despite a plethora of organic reactions that are available in the synthetic arena, a hand-picked number of reactions are used in the medicinal chemistry. The Suzuki reaction for carbon-carbon bond formation and the Buchwald-Hartwig reaction for carbon-nitrogen bond formation are among the top five organic transformations practiced in the pharmaceutical industry. However, both of these reactions are catalysed by highly expensive and depleting palladium catalyst which is not only economically unviable but also residual metal contamination brings toxicity to the finished product. Hence, at the threshold of an era of automated organic synthesis, artificial intelligence and environmental concern, we are geared to streamline the chemical synthesis in a semi-automated cascade manner integrated with green chemistry concepts. We have created a niche area of cascade C-H activation for the synthesis of bioactive natural products and late-stage functionalization where multiple C-H bond activation take place simultaneously in a single operation. This concept has tremendous potential to achieve molecular complexity; chemical methodology and library development (CMLD) for the structure activity relationship (SAR) studies in drug discovery. We have accomplished practical syntheses of indole, indoline, carbazole, fused-2-quinazolones, imizazole moieties and commercial drug candidates such as mefenamic acid, omeprazole a block buster proton pump inhibitor etc. Interestingly, we have developed synthetic methodology for the late-stage modification of amino acids via C-H activation to generate unnatural amino acids. We have developed a controllable 1,2-shift strategy as a switch for the divergent synthesis of molecular structure. This concept will translate into the process development of Boscalid and Glufosinate off-patent agrochemicals for the agricultural sector in India. The present talk is focused on the journey from metal to metal-free switchable divergent and cascade synthesis of privileged medicinal scaffolds.



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3. Begam, H. M.; Chowdhury, R.; Behera, A.; Jana, R. *Org. Lett.* **2019**, 21, 4651-4656.

Personal Profile

Dr. Ranjan Jana obtained his Ph.D. in 2007 from The Indian Association for the Cultivation of Science (IACS) under the guidance of Professor B. C. Ranu. He did his first postdoctoral research at Bar-Ilan University, Israel, with Prof. S. Braverman. Subsequently, he did his 2nd and 3rd postdoctoral research at Kansas University, USA, with Prof. J. A. Tunge and at the University of Utah, USA, with Prof. M. S. Sigman respectively. In 2012, he joined the CSIR-Indian Institute of Chemical Biology as a senior scientist and was promoted to Senior Principal Scientist in his current position. His research area is Green Chemistry, Catalysis, Medicinal Chemistry and Chemical Biology. C-H activation photoredox catalysis for the development of carboxylation and decarboxylative reactions is his current research interest.

Awards:
(i) Fellow of the West Bengal Academy of Science and Technology (WAST), 2020
(ii) Ramanujan fellowship; award no. SR/S2/RJN-97/2012; SERB, India, 2013-2019.

Dr. Ranjan Jana
CSIR-Indian Institute of Chemical Biology,
Kolkata-700032, India
Email: rjana@iicb.res.in

IL-29

Synthesis of Carbazoles via Palladium-Catalyzed Aryl C–H Activation Under Green Conditions and Study of Their Interactions with Calf-thymus DNA

Safiul Alam*, Rejaul Karim, Aminur Khan, Asifur Rahaman Mallick and Md Samiul Islam
Department of Chemistry, Aliah University, IIA/27, New Town, Kolkata-700160, INDIA
E-mail: safiul_ku@yahoo.co.in; safiulalam.chem@gmail.com

Abstract

The carbazole nucleus is one of the most important heterocyclic units found in both synthetic and naturally occurring alkaloids, which have attracted considerable attention, owing to their diverse applications in medicinal chemistry and material sciences.[1,2] In recent years, there has been focus on the development on transition metal-catalyzed coupling reactions under mild conditions,[3] towards fast and atom economy chemical processes, as compared with classical multi-step organic synthesis, thus rendering synthetic routes more straightforward and economically feasible. Now-a-days, scientists are more interested to develop sustainable methods following the Green Chemistry Principles to minimize the burden on the environment by using green solvents, less expensive safer reagents, and efficient energy sources.[4] In continuation of our interests in the synthesis of bioactive molecules,[5] and encouraged by the growing demand for milder, less hazardous and economical protocols for the synthesis of heterocyclic molecules, we explored transition metal-catalyzed C–N and C–C cross coupling reactions using an organic base in *N*-arylation of anilines and intramolecular C–H activation[6] reactions for the synthesis of carbazoles under green conditions.[7a]

This presentation highlights the methodology developed by us involving Cu-catalyzed *N*-arylation of *o*-iodoanilines with arylboronic acids, followed by Pd-catalyzed intramolecular aryl C–H activation of 2-iodo-*N*-arylanilines under microwave-assisted conditions.[7b] Use of an 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU) as base was found beneficial than other amines or inorganic bases, and advantageously substitutes *P*- or *NHC*-ligands in the Pd-catalyzed C–H activation step, thus allowing access to carbazoles bearing various electron donating or electron withdrawing substituents, including halogens or other reactive functional groups.[7] Interactions of carbazoles with calf-thymus DNA have been investigated. Experimental results hint that the dominant mode of binding of carbazoles with ct-DNA is groove binding in nature and highest binding interaction is observed for 4-acetylcarbazole. Reason behind unequal interactions for different carbazoles could be rationalized by considering the nature and position of functional groups at carbazoles which can affect H-bonding and hydrophobic interactions. Results are in good agreement with molecular docking studies.[7] Recently, we have replaced the organic solvent with water as a green solvent to develop a novel method for synthesizing functionalized carbazoles with an emphasis on environmental safety. The benefits of this efficient method include a simple experimental procedure relying on the use of water as a reaction medium instead of hazardous organic solvent and use of easily accessible surfactant, organic base, and microwaves as an efficient green energy source. Applications of this methodology towards the synthesis of various fused heterocyclic compounds are in progress.

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Personal Profile

Dr. Safiul Alam did his B.Sc. and M. Sc. in Chemistry from University of Calcutta. He obtained his Ph.D. in 2006 from University of Kalyani, under the guidance of Professor K. C. Majumdar. During doctoral research, he worked on the synthesis of indole derivatives and other heterocyclic compounds. He carried out post-doctoral research with Professor Duen-Ren Hou in National Central University, Taiwan (2007-2008) and then with Professor Hamid Dhimane in Paris Descartes University, France (2009-2010). After postdoctoral studies he engaged as Senior Research Scientists in Jubilant Chemsys Ltd., Noida and TCG Lifesciences Ltd., Kolkata (2010-2012). Then, in October 2012, Dr. Alam joined Aliah University as Assistant Professor and started his independent research. He has published a book and many research papers in reputed international journals. Currently, his research group is working on transition metal catalyzed cross coupling reactions under green conditions employing microwave irradiation towards the synthesis of heterocyclic compounds having bioactive potential, and studies their applications in medicinal chemistry and material sciences.

Dr. Safiul Alam
Aliah University
IIA/27, New Town, Kolkata 700160, India
E-mail: safiul_ku@yahoo.co.in;
safiulalam.chem@gmail.com

IL-30

Hydrazino Helicenes: Unlocking their Potential as High-Energy Organic Molecules for Rechargeable Lithium-Ion Batteries

Dr. Palash Pandit

Department of Chemistry, Saheed Nurul Islam Mahavidyalaya, West Bengal State University, West Bengal, India.

E-mail: palashpandit@gmail.com

Abstract

The synthesis of non-planar π-conjugated organic molecules, such as helicenes and bowl-shaped aromatic compounds, has garnered significant attention due to their unique properties and applications. Despite extensive research on redox-based electron transfer in organic substances, acid/base or chemical responsive organic redox active materials have been less studied. We serendipitously synthesized novel non-planar heterohelicene derivatives, namely N-N linked tetramethyl-biacridine (TBA) and bicarbazole (BC) derivatives. These compounds exhibit highly reversible electron transfer disproportionation in the presence of acid stimuli, undergoing homolytic N-N bond cleavage/formation reactions to form stable radical cations and corresponding reduced species (Figure-1).[1a, 1b]

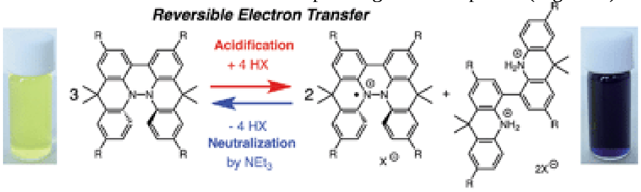
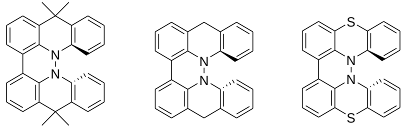


Figure 1. Acid/base-regulated electron transfer disproportionation

Our study introduces new design concepts for acid/base-regulated organic electron transfer systems, chemical reagents, and organic materials. Hydrazine-linked polyheterocyclic compounds may serve as promising cathode active materials due to their unique properties, including acid-controlled reversible electron transfer disproportionation, and highly stable radical cations.



1 2 3

Figure 2. Substituted/unsubstituted N-N linked polyheterocyclic compounds

The electrochemical oxidation potential of these compounds shows reversible two-electron oxidation, making them suitable candidates for active ingredients in rechargeable lithium-ion organic batteries (Figure-2).[1c, 1d, 1e]

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Personal Profile

Dr. Palash Pandit is an Assistant Professor at Saheed Nurul Islam Mahavidyalaya affiliated with West Bengal State University, India. He obtained his Ph.D. in Chemistry from the University of Calcutta in 2011 under the guidance of Professor Dilip Kumar Maiti.

postdoctoral research experience includes stints at:

- National Cheng Kung University (NCKU), Taiwan (2011
- The University of Tokyo, Japan (2012
- Institute of Molecular Science, Japan (2013

Sakurai and S. Higashibayash

Prior to joining SNIM, Dr. Pandit served as a Senior Research Scientist at TCG Life Science Pvt. Ltd., Kolkata, India (2016-2020).

Dr. Palash Pandit
SNIM, West Bengal State University,
India
Email: palashpandit@gmail.com

IL-31

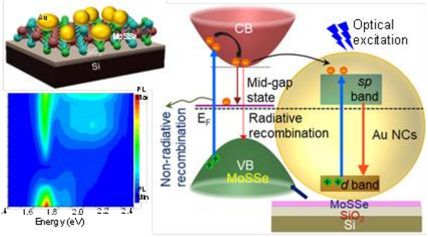
Tuning exciton-plasmon interaction in transition metal dichalcogenides coupled with noble metal nanostructures

Achintya Singha
Department of Physical Sciences, Bose Institute, 93/1, Acharya Prafulla Chandra Road, Kolkata-700009, India
E-mail: achintya@jcbose.ac.in

Abstract

In the realm of 2D materials, transition metal dichalcogenides (TMDCs) have drawn immense research attention in the field of optoelectronics due to their superior excitonic properties [1, 2]. However, low photoluminescence (PL) quantum yield hampers their efficacy as active materials, and a narrow spectral window also limits their applications in photonic and optoelectronic devices [3, 4]. In this regard, bandgap engineering through alloying TMDC and integrating them with plasmonic nanostructures offers a promising avenue for tuning and enhancing excitonic behavior in TMDCs [5].

In this talk, I will show a strategy to efficiently modify the exciton-plasmon coupling of alloy TMDC MoSSe by mechanically integrating Au nanoclusters (NCs) [6]. The Au/MoSSe hybrid exhibits a broad emission spectrum spanning from the UV-vis to NIR region, making it a promising candidate for broadband optoelectronic applications. By introducing size-dependent Au NCs over MoSSe, we successfully achieve quenching due to charge transfer as well as subsequent enhancement in optical properties. Our theoretical investigation sheds light on the role of mid-gap electronic states, resulting in nonradiative dissociation of emission in the optical properties of Au/MoSSe hybrids leading to quenching phenomenon. After the evolution of the size of Au NCs, the local surface plasmon resonance effect becomes a crucial factor in enhancing the optical properties. Thus, we present a novel approach to engineer the exciton-plasmon interaction within an optically active TMDC/plasmon hybrid.



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Personal Profile

Professor Achintya Singha is a scientist with expertise in experimental research in the field of Condensed Matter Physics and Materials Science. He was born in 1977 and earned his M.Sc. in Physics at Jadavpur University in 2001, a Ph.D. in Physics at the Indian Institute of Technology Kharagpur in 2006, and completed a Postdoctoral Fellow position at the National Enterprise for NanoScience and NanoTechnology (NEST), Scuola Normale Superiore (SNS), Pisa, Italy, from 2007 to 2010. Professor. Singha joined the Department of Physics at Bose Institute in 2010, and he is currently a Professor in the same department. Professor Singha received the Best Ph.D. Thesis Award at the 51st DAE Solid State Physics Symposium in 2006. His current research area includes Raman spectroscopy, optical spectroscopy, optoelectronics and valleytrtonics of quantum materials. He has supervised and mentored research activities for many pre-doctoral and post-doctoral fellows and other researchers. Professor Singha has authored more than 92 peer-reviewed papers in reputed international journals, with an average Impact Factor of 5.5, and his h-index is 27. Some of his works have been published in top-quality journals, including Science, Nature Communications, Physical Review Letter, Physical Review B, etc. He has been actively involved in various scientific bodies and committees at the national level, serving as a member of the Expert Committee and Task Force Committee of the Science and Engineering Research Board (SERB), India.

Achintya Singha
Department of Physical Sciences, Bose Institute,
93/1, Acharya Prafulla Chandra Road, Kolkata-
700009, India
E-mail: achintya@jcbose.ac.in

IL-32

Enhanced antibacterial activity of azithromycin conjugated magnetic nanocarrier

Moupiya Ghosh
Department of Physics, Basic Science & Humanities, Institute of Engineering and Management (IEM), Kolkata, University of Engineering and Management, Newtown, Kolkata-700160, West Bengal, India
E-mail: moupiyaghosh29091994@gmail.com

Abstract

Antibiotics, including metronidazole, sulfamethoxazole, erythromycin, trimethoprim, penicillin, and, azithromycin (AZM) have become the most widely used medications in recent years to treat a variety of illnesses in aquaculture, contemporary husbandry, and people[1a,b]. However, the use of these antibiotics may show several side effects. Serious adverse effects from azithromycin include liver damage, hearing loss, serious or life-threatening allergic reactions, abnormal heartbeats, and diarrhea linked to clostridium deficiency[1c]. Recent developments point to the potential application of nanotechnology to alleviate some of AZM's drawbacks, including its high dosage requirements and poor absorption. Because of their small size (1–100 nm) and high surface–to–volume ratio, nanoparticles (NPs) are a useful method of delivering AZM[1d,e]. These carriers have the power to lessen the negative effects on the entire body, ensure accurate transport of the medication to the designated site, and enhance the pharmacokinetics of the medicine. Additionally useful for the development of contemporary sensors and biosensors that can be used in both industrial and biomedical fields are spinel ferrites[1f,g]. Furthermore, these nanoparticles (NPs) have demonstrated potent antibacterial properties in specific formulations. Among the several ferrites, $MgFe_2O_4$ is widely used in medicine due to its unique magnetic and physical characteristics.In the present work, $MgFe_2O_4$ nanoparticles have been synthesized by sol-gel method and applied to target the antibiotic Azithromycin (10 mol% drug has been conjugated). The samples have been well characterized by the analysis of the XRD, EDS pattern, FESEM and TEM images analysis. The enhanced activity of the drug-conjugated sample against Gram- positive bacteria has been confirmed by Agar – cup assay and MIC study. It has been revealed that the drug-conjugated nanoparticles (with 10 mol% azithromycin) and the pure 100% azithromycin have almost similar efficacy against bacteria. This confirms the enhanced activity of azithromycin after its conjugation with the nanoparticles.

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Personal Profile

Dr. Moupiya Ghosh obtained her Ph.D. in 2022 from The University of Burdwan under the guidance of Prof. Swapan Kumar Pradhan. She worked as a postdoctoral fellow under the mentorship of Professor Jaydeep Basu at IISC Bangalore. She also worked as an Assistant Professor at the Department of Physics, Amity University, Kolkata, and at Brainware University, Kolkata. Her research expertise includes nanomedicine, nanotechnology, drug delivery, structural and microstructural characterizations, synthesis of different nanoconjugates, development of different antibacterial, antifungal and antidiabetic agents, cancer therapeutics and wastewater treatment. Her research is focused on the development of different drug conjugated nanomaterials for the treatment of common and epidemic diseases with minimum side effects and higher efficacy. She has published more than 20 SCI, SCOPUS Indexed articles in several reputed international journals. She has received several International, National and State Awards in the field of research. Presently, she is working as an Associate Professor in the Department of Basic Science and Humanities, IEM, UEM, Kolkata.

Awards
University Gold Medalist (1st class first in M.Sc); 2019;
Outstanding Paper Award in 27th West Bengal State Science and Technology Congress, 2020;
International Best Research Award (SF), 2020;
ISSN International Best Researcher Award, 2022;
Record Owner Young Scientist Award, 2023;
Membership by World Research Council.
INTERNATIONAL Best Researcher Award (International Science, Technology & Research Awards Congress 2024. ISTRA);
Member of the American Chamber of Research;
Research Excellence Award (INSC), 2024;
Empowering Woman Award (ICST 2024)

Moupiya Ghosh
University of Engineering and Management,
Newtown, Kolkata-700160, West Bengal, India
E-mail: moupiyaghosh29091994@gmail.com

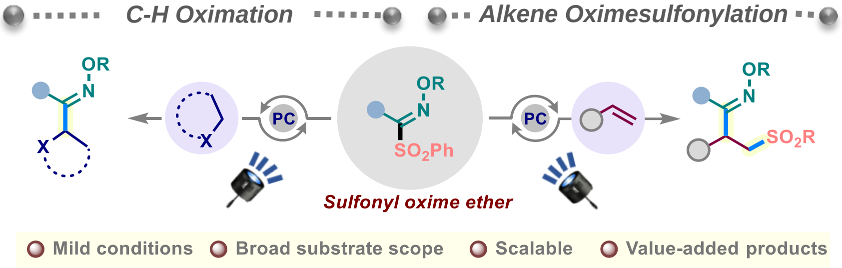
IL-33

Light-Induced Oxime Group Transfer Using Sulfonyl Oxime Ethers

Joyram Guin
School of Chemical Sciences
Indian Association for the Cultivation of Science (IACS)
Jadavpur, Kolkata-32, India
ocjg@iacs.res.in

Abstract

Oximes are pharmacophores and versatile precursors to many important functional groups. Synthesis of functionalized oximes via direct introduction of oxime group to chemical feedstocks receives significant interest but remains a formidable challenge. Recently, our group has developed a photocatalytic method for the direct incorporation of oxime functional group into C(sp3)-H bonds of chemical feedstocks using sulfonyl-oxime-ethers.[1] Furthermore, utilizing the well-known sulfonyl-oxime-ethers as bifunctional reagents, a novel metal-free photochemical strategy for transfer oximesulfonylation of olefins has been demonstrated.[2] These interesting findings will be elaborately discussed during the lecture.



Scheme: Light-induced oxime group transfer

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Personal Profile

Professor Joyram Guin obtained his Ph.D. in 2007 from International Graduate School of Chemistry, Westfälische Wilhelms-Universität, Muenster, Germany under the guidance of Professor Armido Studer. After postdoctoral studies with Professor Jerome Lacour at University of Geneva, Switzerland (2008-2010) and Professor Benjamin List at Max-Planck-Institut für Kohlenforschung, Germany (2010-2012), he started his independent career at Indian Association for the Cultivation of Science (IACS), Kolkata, India. The research interest of his groups includes a) the development of new generation method for organic transformations using molecular oxygen (O_2) as the benign oxidant, b) asymmetric organocatalysis using N-heterocyclic carbenes (NHCs), c) organic synthesis involving visible-light-mediated photocatalysis.

Prof. Joyram Guin,
Indian Association for the Cultivation of
Science (IACS), Kolkata, India

IL-34

Ligand-Centered Redox Induced Chemical Transformations

Dr. Nanda D. Paul
Department of Chemistry, Indian Institute of Engineering Science and Technology, Shibpur
Botanic Garden, Howrah 711103, India
Email: ndpaul@gmail.com; ndpaul2014@chem.iiests.ac.in

Abstract

The chemistry of transition metal complexes of redox-noninnocent ligands has gained immense attention over the years because of its interesting electronic structures. Over the decades, the primary research in this area was focused on understanding the ambiguous electronic structure and bonding of such complexes. Only in the last decade, it has shifted more to catalysis and, very recently, towards more physical applications upon realizing the fact that redox-noninnocent ligands, other than coordinating metal ions and offering steric control, can participate synergistically with the metal ions during electron transfer events and influence a chemical transformation in many ways.

This lecture will focus on various ligand-centered redox-induced chemical transformations, both stoichiometric and catalytic. A few examples will be discussed, including how interconversion between mono- and multi-metallic complexes can be achieved by controlling the ligand-centered redox events. Particular emphasis will be given to how radical-type reactions can be achieved in a controlled manner using 3d-metal-catalysts, avoiding thermodynamically unfavorable metal-centered redox events and making the overall process eco-friendlier and more sustainable.

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Personal Profile

Dr. Nanda Dulal Paul obtained his Ph.D. in 2012 from IACS, Kolkata under the guidance of Professor Sreebrata Goswami. After postdoctoral studies with Professor Bas de Bruin at Van’t Hoff Institute for Molecular Sciences, University of Amsterdam (2012-2013), he started his independent career as an Assistant Professor at the Department of Chemistry, IIEST, Shibpur in January 2014. He is currently holding the Associate Professor position. His current research is focused on developing new catalysts and catalytic strategies for sustainable and eco-friendly catalysis.

Awards:

2024	Thieme Chemistry Journals Award – 2024
2024	2023 Professor D.K. Banerjee Memorial Lecture Award (by Department of Organic Chemistry, IISc, Bangalore)
2019	Young Faculty Research Award (by Alumni Association Washington Metro Area, and GAABESU Shibpur Foundation, USA)
July 2012	ERC fellowship for post-doctoral research at the Van't Hoff Institute of Molecular Sciences, University of Amsterdam, The Netherlands
July 2010	Senior Research Fellow, Council of Scientific and Industrial Research (CSIR), India
2007	Qualified NET-JRF (National Eligibility Test, India) on the basis of a national level competitive examination
2007	Qualified GATE (Graduate Aptitude Test in Chemical Sciences, India)
2000	Awarded National Scholarship for Secondary Examination (10th standard)

Dr. Nanda Dulal Paul,
IIEST, Shibpur, India

IL-35

New Strategies For Benzoheterocycle Synthesis and Functionalization

S. Peruncheralatan
School of Chemical Sciences, NISER Bhubaneswar, an OCC of Homi Bhaba National Institute, Khurda – 752050, INDIA
E-mail: peru@nser.ac.in

Abstract

Benzoheterocycles, compounds featuring fused benzene and heterocyclic rings, are essential frameworks in drug design, agrochemicals, and advanced materials, valued for their structural diversity and biological activity. Traditional synthesis methods have strengths and limitations, but recent advancements offer more efficient and sustainable options. These include metal-free and catalytic strategies that prioritize selectivity, efficiency, and eco-friendliness.Our research focuses on developing new methodologies for benzoheterocycle synthesis, with an emphasis on the advantages of metal-free and environmentally friendly transition-metal-catalyzed processes. Recently, we designed a hypervalent iodine-mediated reaction that promotes C–N bond formation and produces benzo-fused heterocycles under mild conditions. In the course of this work, we found an unexpected dearomatization of N-protected pyrazoles, yielding functionalized pyrazolines with notable pharmaceutical potential. These methods provide a versatile toolkit for constructing benzoheterocycles with enhanced efficiency and a smaller environmental footprint. Together, our approaches highlight the expanding role of sustainable strategies in heterocyclic chemistry, opening new possibilities for applications in biomedical and material sciences. In this conference, we will provide a comprehensive review of our methods.

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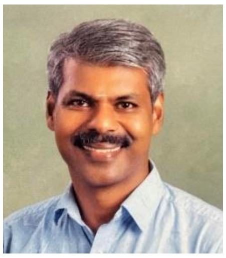
Personal Profile

Dr. S. Peruncheralathan is an Associate Professor of Synthetic Organic Chemistry at NISER Bhubaneswar. He began his research career in 1998 as a Junior Research Fellow under Prof. H. Ila at IIT Kanpur, where he completed his Ph.D. in 2004. Following this, he conducted postdoctoral research with Prof. Christoph Schneider at Universität Leipzig, Germany, supported by an Alexander von Humboldt Fellowship. In 2010, he joined NISER as an Assistant Professor, was promoted to Reader–F in 2012, and has held the position of Associate Professor since 2019.



S. Peruncheralatan
School of Chemical Sciences, NISER
Bhubaneswar, an OCC of Homi Bhaba National
Institute, Khurda –752050, INDIA
E-mail: peru@nser.ac.in

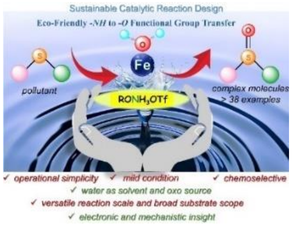
IL-36

Unlocking an Eco-Friendly -*NH* to -*O* Functional Group Transfer Strategy for In-water Transformation of Organic Sulfides

Arya Singh[#], Yashdeep Maurya[#] and **Sayanti Chatterjee****
Department of Chemistry, Indian Institute of Technology Roorkee, PIN-247667, INDIA
E-mail: sayanti.chatterjee@cy.iitr.ac.in

Abstract

Our research group explores toward developing sustainable catalytic solutions for converting wastes to value added product. Organic sulfides, particularly the volatile ones, are potential impurities found in wastewater. Besides, they have significant health hazard and need remedial strategies.[1] One potential way of removing organic sulfide impurities (R-S-R') would be their catalytic functionalization (-S=X, X = -O- or -NH- group, oxygenation or imination), involving an overall oxidation on the S atom. The traditional approaches for oxidation/imination reactions of organic sulfides involve putative high valent metal oxo/imino intermediate, harsh oxidants, mostly under non-aqueous organic solvent medium and the reactivity and selectivity is often limited due to the instability of the proposed metal-oxo/metal-nitrogen intermediates.[2-4] Thus oxo/nitrogen group transfer reactions with a versatile and broad substrate scope under ambient condition remain a challenge, particularly in aqueous medium or under solvent free conditions and impose a barrier for these reactions to create an impact in the realm of sustainable catalysis. Herein, we present an unprecedented strategy for unlocking a new and efficient -*NH* to -*O* functional group transfer protocol for the synthesis of a variety of organic sulfoxides chemoselectively, using water as the source of oxygen atoms (Scheme 1). The functional group transfer strategy employs earth abundant iron catalyst and bench-stable and convenient-to-handle surrogates[5] to replace highly sensitive and reactive high valent iron intermediates, operates under mild conditions in water or under solvent free condition, exhibits broad functional group tolerance, is scalable and proceeds without the use of any precious metal catalyst or additional oxidant. A comprehensive electronic and mechanistic investigation, supported by DFT calculations, has been conducted to elucidate the reaction mechanism. The reported work aligns well with the prospect of green and sustainable chemistry and is expected to unlock new concepts in the emerging research area of catalytic functional group transfer reactivity.[6]



Scheme 1: Iron Catalyzed -*NH* to -*O* Functional Group Transfer Strategy in Water

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Personal Profile

Dr. Sayanti Chatterjee has completed her Bachelors from Scottish Church College Kolkata in the year 2007 and Masters from University of Calcutta, Kolkata, India in the year 2010. She completed her PhD from the Indian Association for the Cultivation of Science, India, in the year 2016 in Bioinorganic Chemistry. Then she moved to University of Virginia, U.S.A (2017) to gain postdoctoral experience on electrochemistry and energy relevant catalysis and subsequently in June 2018, she joined the Max-Planck-Institut für Kohlenforschung (MPI Kofo), Germany with the Alexander von Humboldt Research Fellowship. Since September 2020, she joined the Department of Inorganic Spectroscopy, at the Max Planck Institute for Chemical Energy Conversion (MPI CEC) as a postdoctoral research fellow. In 2022, she moved back to India to start her independent career as an Assistant Professor at the Department of Chemistry, Indian Institute of Technology Roorkee. Dr. Sayanti has been awarded with the DST INSPIRE Faculty Fellowship Award, SERB-Starting Research Grant as well as CSIR ASPIRE research grant from different funding bodies in India for supporting her research. Since August 2024, Sayanti has been appointed as the Head of the Partner Group of the Max Planck Institute for Chemical Energy Conversion Germany at the Indian Institute of Technology Roorkee, India.

Her research group, the PO!TION LAB is devoted to explore a journey from poison to potion, focusing on sustainable catalytic approaches, to identify downstream organic synthesis applications by synthesis of new inorganic complexes and explore fundamental reactivity.

Awards
Alexander von Humboldt Postdoctoral Fellowship, Germany
DST INSPIRE Faculty Fellowship Award, India
Head of Max Planck Partner Group, Max Planck Institute for Chemical Energy Conversion, Germany.

Prof. Sayanti Chatterjee
Department of Chemistry, Indian Institute of Technology,Roorkee, PIN-247667, India
E-mail: sayanti.chatterjee@cy.iitr.ac.in

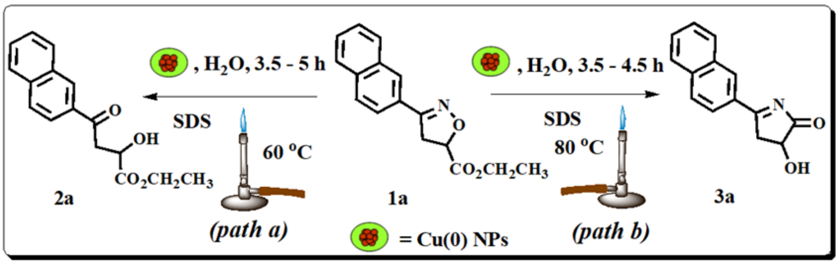
IL-37

Synthesis of Low-Valent Metal Nanoparticles By Green Method And Development of Their Catalytic Reduction Properties

Dr. Krishnanka Shekhar Gayen
Assistant Professor in Chemistry, Raja Peary Mohan College, Uttarpara, Hooghly
E-mail: gayenks@gmail.com

Abstract

The idea of construction of a nanoreactor in aqueous medium by cooperative assembly 1 of surfactant and organic reducing agent leads to formation of a reverse micelle-like supramolecular architecture was envisioned. The ingredients assembled to form a reverse micelle-type supramolecular architecture involving non-selective gluing interactions. The NPs so synthesized were fully characterized by UV-vis spectroscopy, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), powder X-Ray Diffractometry (XRD) and Dynamic Light Scattering (DLS) measurements. Selective activation of N–O bond and its reductive cleavage are important processes for both biochemical and chemical synthesis of valuable compounds. Our fabricated NPs in green medium chemoselectively reduced functionalized Δ 2 -isoxazolines possessing an ester functionality to afford valuable 2- hydroxy-4-keto ester synthons with fast reaction convergence (3.5–5.0 h) and good yields.



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Personal Profile

Dr. Krishnanka Shekhar Gayen obtained his Ph.D. in 2014 from University of Calcutta under the guidance of Professor Dilip Kumar Maiti. After postdoctoral exposure with Professor Toshiyuki Hamura at Kwansei Gakuin University, Japan (2014), he was recruitedas the Assistant Professor in 2015. Visiting Professorships at Rani Rashmoni Green University, Hooghly (2020 - 2023). Awards: Kunjabehari Basak Silver Medal from Presidency College CSIR-Shyama Prasad Mukherjee Fellowship Young Scientist Awards by Indian Chemical Society.

Dr. Krishnanka Shekhar Gayen
Assistant Professor in Chemistry, Raja Peary Mohan College, Uttarpara, Hooghly
E-mail: gayenks@gmail.com

IL-38

Green and sustainable synthesis: Our developments

Dr. Bubun Banerjee
Assistant Professor, Department of Chemistry, Akal University, Bathinda, Punjab, India-151302.
E-mail: banerjeebubun@gmail.com

Abstract

The chemical science contributes significantly to the economic well-being of people. Yet, it faces immense societal and environmental challenges that require reevaluation of the existing traditional approaches along with interactions of professionals from all sectors and disciplines. The benefit of modern science is entirely dependent on the rapid dissemination of research results. On the other hand, *Mother Nature* needs to be protected from ever increasing chemical pollutions associated with synthetic organic processes. It is the fundamental challenge for today's methodologists to make their protocols more environments friendly and sustainable by avoiding the extensive use of hazardous reagents, catalysts and solvents, harsh reaction conditions *etc*. In recent times, applications of metal-free organocatalysis have received huge attention due to its environmentally benign nature. In 2021, Germany's Prof. Benjamin List and US-based researcher Prof. David MacMillan received the Nobel Prize for their development to flourish this precise and new tool for molecular construction. Like many others, their achievements motivated us to develop new methods by using various metal-free organocatalysts under mild and environmentally benign conditions. Towards this goal, within the last few years, we have developed many simple, efficient and environmentally benign processes for the synthesis of a series of biologically promising acyclic, carbocyclic and heterocyclic compounds using various organocatalysts under diverse reaction conditions. Many of our synthesized compounds reported to possess significant biological efficacies. In majority of the cases we were able to reuse the reaction medium along with the catalyst. Gram scales productions were also achieved by using our developed protocols. We are the first group to use mandelic acid as a catalyst for various organic transformations. Along with that, we have also used other metal-free organocatalysts such as glycine, camphor sulfonic acid, trisodium citrate dehydrate, sodium dodecyl sulphate *etc* as catalysts.

References:

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Review articles: (a) *ChemistrySelect*, **2017**, *2*, 8362-8376; (b) *ChemistrySelect*, **2018**, *3*, 5283-5295; (c) *Curr. Green Chem*., **2018**, *5*, 150-167; (d) *ChemistrySelect*, **2018**, *3*, 12918-12936; (e) *Curr. Org. Chem*., **2018**, *22*, 208-233; (f) *Curr. Microwave Chem*., **2020**, *7*, 5-22; (g) *Ultrason. Sonochem*., **2017**, *35*, 1-14; (h) *Ultrason. Sonochem*., **2017**, *35*, 15-35; (i) *Aust. J. Chem*., **2017**, *70*, 872-888; (j) *J. Serb. Chem. Soc*., **2017**, *82*, 755-790; (k) *ChemistrySelect*, **2019**, *4*, 2181-2199; (k) *Synth. Commun.*, **2022**, *52*, 1635-1656; (l) *Phys. Sci. Rev.* **2022**, 7, 539-565; (m) *Synth. Commun.*, **2021**, *51*, 3209-3236; (n) *Synth. Commun.*, **2021**, *51*, 1100-1120; (o) *Curr. Org. Chem.* **2021**, *25*, 209-222.Book chapters: (a) Banerjee, B.; Kaur, G. Recent advances in photo-irradiated synthesis of bioactive heterocycles in *Green Sustainable Process for Chemical and Environmental Engineering and Science,* **2020**, pp 407-452. https://doi.org/10.1016/B978-0-12-819539-0.00016-6; (b) Banerjee, B. Magnetically separable nanocatalyzed synthesis of bioactive heterocycles in water in *Green Sustainable Process for Chemical and Environmental Engineering and* Science, 2020, pp 153-190. https://doi.org/10.1016/B978-0-12-819542-0.00005.

Personal Profile

Bubun Banerjee graduated (B.Sc (Hons.) in Chemistry) from St. Xavier's College Kolkata in 2008 and did M.Sc Chemistry with Organic Chemistry specialization from the University of Delhi in 2010. Later on, he conducted his doctoral research with UGC NET Fellowship under the supervision of Prof. Goutam Bramhachari at the Department of Chemistry and received his PhD degree in 2016 from the Visva Bharati (a central University) founded by Gurudev Rabindranath Tagore. Dr. Banerjee worked as an Assistant Professor at the Department of Chemistry, Indus International University from March 2016-March 2021. At present, Dr. Banerjee is working as an Assistant Professor at the Department of Chemsitry, Akal University, Talwandi Sabo, Bathinda, Punjab, India. Dr. Banerjee is teaching organic chemistry to B.Sc and M. Sc. students. His research interest is based on Green and sustainable developments especially green catalyst and less toxic solvents. He has mentored approximately 12 M.Sc dissertations. Dr. Banerjee acted as the supervisor of five PhD students and one M.Phil student. Dr. Banerjee has published more than 100 peer-reviewed research or review articles along with 20 book chapters. The number of citations of his publications is around 3000. His h-index is 29 and i10 index is 49. He has co-edited 16 books *viz.* '*Organoselenium Chemistry'* (ISBN 978-3-11-062224-9); '*Magnetic Nanocatalysis: Synthetic Applications'* (ISBN 978-3-11-073518-5); '*Magnetic Nanocatalysis: Industrial Applications'* (ISBN 978-3-11-078203-5); '*Organocatalysis: A green tool for sustainable developments*' (ISBN 978-3-11-073753-0); '*Heterocyclic Anticancer Agents*' (ISBN 978-3-11-073926-8); '*Aqueous mediated heterogeneous catalysis*' (ISBN 978-3-11-073845-2); '*Green bond forming reactions: Carbon-carbon and Carbon-heteroaton*' (ISBN 978-3-11-075949-5); and '*Green bond forming reactions: Synthesis of bioactive scaffolds*' (ISBN 978-3-11-079707-7) with eminent scientists. At present he is co-editing 4 books which will be published in 2025. He is editing a book series on '*Green Bioactive Heterocycles*' and published 5 volumes of it by De Gruyter, Germany. As a guest editor he has compiled a number of special thematic issues for the international reputed journals *viz*., '*Current Green Chemistry*', '*Current Organocatalysis*', '*Current Organic Chemistry*', '*Current Microwave Chemistry*', '*Anti-cancer Agents in Medicinal Chemistry*' published by Bentham Science Publication. He has reviewed more than 440 manuscripts of various internationally reputed journals.

Dr. Bubun Banerjee
Assistant Professor, Department of Chemistry, Akal
University, Bathinda, Punjab, India-151302.
E-mail: banerjeebubun@gmail.com

IL-39

Functionalization of heterocycles by exploitation of week bond of hypervalent iodine reagent and its application towards therapeutic interest

Sukanya Das, Pamela Pal, Md. Abbasuddin Sk. and **Raj K. Nandi***
Department of Chemistry, Jadavpur University,
188, Raja S.C. Mallick Rd, Jadavpur, Kolkata, West Bengal 700032, INDIA
E-mail: rkn.chemistry@jadavpuruniversity.in

Abstract

Heterocyclic compounds especially nitrogen containing small heterocyclic molecules have received considerable attention from the synthetic chemists due to its ubiquity nature. More than 75% FDA approved drugs are containing nitrogen heterocycles.[1] Bioactive heterocycle such as Uracil, Coumarin, Carbazole, Indole, isoxazoles always pay attention by the synthetic community due its ubiquity nature as well as wide range of application in pharmaceutical as well as agro chemical sectors. Functionalization of these heterocycles and showing Umpolung reactivity always a challenging for the synthetic chemist.

We mainly focused on synthesis of small heterocycles by environmental benign methods, and examined their bioactivity in terms of therapeutic[2] as well as lravacidal activity against Dengue vector.[3] We also focused on development of new cyclic hypervalent iodine reagent and its application towards synthesis. Functionalization of heterocycles by exploitation of week bond[4] of hypervalent iodine reagent is our one of the major field of research. Very recently we have developed a new Uracil based hypervalent iodine reagent and made some application of these reagent, and we would like to report our findings in this conference.

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2. Pal, P.; Bag, S.; Burman, M. D.; Nandi, R. K.; Bhowmik; S. ChemistrySelect 2024, 9, , e202402561
3. Pal, P.; Show, S.; Das, S.; Bhakta, S.; Mondal, S.; Ror, P.; Ghosh, T.; Nandi, R. K. Synlett 2024, 35, 1877.
4. (a) Das, S.; Datta, T.; Sk, M. A.; Roy, B.; Nandi, R. K. Org. Biomol. Chem., 2024, 22, 6922. (b) Das, S.; Majumdar, P.; Sk, M. A.; Bag, S; Bhowmik, S.; Nandi, R. K. (Manuscript under preparation)

Personal Profile

Dr. Raj Kumar Nandi obtained his Ph.D. in 2014 under supervision of Prof. K. C. Majumdar. In 2014, he joined in the group of Prof. Okiko Miyata at Kobe Pharmaceutical University, Japan, as Postdoctoral assistant. In 2015 he moved to Dr. Guillaume Vincent group as a Marie Curie-IIF postdoctoral fellow at University Paris Saclay, France. In 2017 he joined in the laboratory of Prof. Jérôme Waser at the EPFL, Switzerland for his third postdoctoral venture. In 2019 he joined as an Assistant professor in department of Chemistry, DHWU, Sarisha. Since February 2023, he has been Assistant Professor of Chemistry at the Jadavpur University, India. His current research activities include the study of novel activation modes and development of chemoselective and sustainable transformations towards the synthesis of interesting molecular architectures for therapeutic interest.

Awards:
Best Oral presentation in ICCHD-2018
Marie Curie Fellowship, 2015
Prof. Asima Chatterjee endowment Silver medal for securing 1st position in B.Sc. in Kalyani University.

Dr. Raj Kumar Nandi
Jadavpur, India
E-mail: rkn.chemistry@jadavpuruniversity.in

IL-40

Organic-Inorganic Hybrid Materials for Biomedical Applications

Soumen K. Samanta*
Department of Chemical Science, Biswa Bangla Biswabidyalay, Shipbur, Bolpur, Birbhum-731204, India
E-mail: soumen.kr.samanta@bbb.ac.in

Abstract

Drug discovery, formulation and delivery are major thrusts in chemistry, medicine and biology. A major goal in anticancer chemotherapy is to achieve highly selective delivery to the tumor to ameliorate the adverse effects of highly potent drugs on healthy tissue. It is known that drug delivery systems based on large nanoparticles (e.g., > 5 nm diameter) benefit from the enhanced permeability and retention (EPR) effect,[1] which results in selective accumulation of nanoparticles in the tumor compartment. Nanoparticle-based drug delivery systems have been explored for cancer therapy and imaging. Despite these advances, the delivery of effective doses of anticancer drugs with high spatiotemporal control is still a major challenge. For example, even the blockbuster drug Doxil suffers from the slow release of doxorubicin (<5% in 24 h), which hampers its efficacy.[2] Therefore, the development of new drug delivery vehicles equipped for targeted delivery and stimuli-responsive release is urgently needed.Recently we observed metal organic polygons and polyhedra (MOPs) to be suitable platform for the development of novel hybrid materials for potential nanoparticle-based drug delivery and imaging applications.[3-6] (Mixed) self-assembly allowed us to prepare Fujita-type metal organic polyhedron that were subsequently functionalized with suitable organic macrocycles with well-defined molecular recognition properties. Large particle size along with host-guest properties are employed here to selectively deliver anticancer drug (prodrug of doxorubicin), imaging agent like nile red to cancer cells. Nontargeted delivery was achieved benefitting from EPR effect. Attaching cell targeting ligands (c-RGD) to the MOP based nanoparticle enables targeted encapsulation of the nanoparticles by the U87 glioblastoma cells - which expresses c-RGD binding integrin receptors demonstrating the confluence effect of large size of the particles and targeting effect on delivery.

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Personal Profile

Dr. Soumen K. Samanta obtained his Ph.D. in 2013 from University of Siegen, Germany under the guidance of Professor Michael Schmittel. He did his postdoctoral studies with Professor Lyle Isaacs (2014-2018) at University of Maryland, USA and Prof. Anthony P. Davis (2019-2023) at University of Bristol, UK. Currently he is working as guest faculty at the department of Chemical Science at Biswa Bangla Biswabidyalay (University).

Awards and Accomplishment:
9th rank in All India Joint Admission for MSc (JAM).
DST INSPIRE FACULTY Award

Soumen K. Samanta*
Department of Chemical Science, Biswa
Bangla Biswabidyalay, Shipbur, Bolpur,
Birbhum-731204, India
E-mail: soumen.kr.samanta@bbb.ac.in

IL-41

Design and Development of Cu/Fe/In/Eu/Zn Complexes and Coordination Polymers for Sustainable Health and Environmental Applications

Manik Das and **Tithi Maity***
Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur, West Bengal, INDIA
E-mail: titlipkc2008@gmail.com

Abstract

The development of cisplatin as an anticancer drug [a] has sparked intense research into non-platinum metal complexes with potent anticancer properties, minimal side effects, and diverse applications, with DNA and proteins being key targets for these complexes [b, c]. Currently, there is a pressing need for innovative solutions in the selective detection of explosives, biomolecules, cations, and anions, as well as anticancer therapy with reduced side effects. Along with organic chemosensors, the use metal-based chemosensors for detection purposes is an acceptable approach [d, e].

To address these challenges, our research focuses on designing and developing copper (Cu) complexes for DNA/protein binding, and anticancer properties as non-platinum-based drug development research gives Cu complexes a prestigious position [f]. Additionally, zinc (Zn), europium (Eu), and indium (In) complexes are being developed for optical and spectroscopic detection of biomolecules, whose detection and quantification in living cells is a front-line research work. Iron (Fe) and Zn complexes are being explored as metalloreceptors for environmentally toxic metal ions and explosive detection as their excess presence creates health hazards to both the environment and humans. The sensing phenomena are evaluated using optical and spectroscopic techniques, paving the way for cutting-edge applications in biomedical and environmental research, with the ultimate goal of developing effective and sustainable solutions for healthcare and environmental sustainability.

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Personal Profile

Dr. Tithi Maity, Associate Professor, Ph.D. in Chemistry (2007) from Vidyasagar University, under the guidance of Prof. Ajit Kumar Banthia, Materials Science Center, IIT, KGP and Prof. Sudipta Dolai, Vidyasagar University. with over 14 years of academic experience as Assistant Professor at Hijli College (2010-2015) and Prabhat Kumar College (2015-present), possessing research expertise in development of metal complexes with biomedical applications, chemosensing, and quantum dots, with a strong publication record of over 65 peer-reviewed journals.

Awards

Research Excellence Award from Indian Chemical Society 2019
Outstanding Paper Award from West Bengal State Science Congress, 2020
Best Poster Award in Indian Science Congress, 2022

Tithi Maity
Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur, West Bengal, INDIA
E-mail: titlipkc2008@gmail.com

IL-42

Introduction of Jeanbandyite Currency in Material World

Goutam Biswas*
Department of Chemistry, Cooch Behar Panchanan Barma University, Panchanan Nagar,
Cooch Behar-736101, INDIA
E-mail: goutam@cbpbu.ac.in

Abstract

The Design, synthesis, and characterization of perovskites have been the focus of significant research in recent years, owing to their use in many different domains. Jeanbandyite, a member of the perovskite family that was discovered in Bolivia, is one of the substances that has not yet been thoroughly investigated. The superparamagnetic behavior of the Jeanbandyite structure has not been described in any of the earlier reports on this type of structure. The design and synthesis of a jeanbandyite structure with superparamagnetic properties is a significant breakthrough, as the magnetic characteristic could provide an additional benefit to this hydroxide perovskite[1].

Jeanbandyite has been employed as a catalyst to produce 2,3-Diaminophenazine (DAP) in a more economical and environmentally friendly manner[2]. To ascertain whether DAP can be employed as a bioprobe in bioapplications, its cytotoxicity and cellular absorption properties were also examined. Additionally, DAP binding to DNA was carefully performed and verified by molecular docking. Jeanbandyite and its composites have also been employed for the degradation of dyes under solar radiation. Jeanbandyite may prove to be a fascinating and intriguing material science contender in the future.

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Personal Profile

Dr. Goutam Biswas obtained his Ph.D. in 2006 from IICB, Kolkata under the guidance of Dr. Anup Bhattacharjya. After postdoctoral studies with Professor Sung Kee Chung at POSTECH, South Korea (2006-2008), and Prof. Michael Pirrung at University of California, Riverside, he started his career as Scientist 1 at Sai Life Sciences, Pune. Then he moved to Ewha University, Seoul, South Korea as Postdoctoral Research Associate (2013-2015). After working as Scientist II at Invictus Oncology, Delhi, Dr. Biswas started his independent career as Assistant Professor at Cooch Behar Panchanan Barma University (2018-till date). Visiting Professorships at Soonchunhyang University (Asan, South Korea, 2022), at University of Gour Banga (Malda, India, 2018-till date).

Awards:

CSIR NET-JRF Fellowship 2001
BK-21 Fellowship

Dr. Goutam Biswas
Department of Chemistry, Faculty of Chemistry
Cooch Behar Panchanan Barma University, India
E-mail: goutam@cbpbu.ac.in

IL-43

Recent Progress in Hydrogenated Diamond-Like Carbon Thin Films: Deposition Techniques and Surface Engineering Innovations

Hari Shankar Biswas*

Department of Chemistry, Surendranath College, 24/2, Mahatma Gandhi Road, Kolkata-09, India

Abstract

The synthesis and processing of advanced materials are critical for technological innovations in fields like electronics and biomedical engineering. This review comprehensively examines the latest progress in deposition methods for hydrogenated diamond-like carbon (HDLC) thin films, alongside diverse surface modification techniques. It begins with an introduction to HDLC films, outlining their exceptional properties and extensive applications, which underline their significance in contemporary material science. The review explores deposition methods in depth, focusing on chemical vapor deposition (CVD) and physical vapor deposition (PVD), highlighting their principles, advantages, and challenges. In addition, the paper investigates cutting-edge surface modification techniques, such as plasma treatments, ion implantation, and laser-based methods, providing insights into their processes and their roles in tailoring material properties. By bridging theoretical understanding with practical insights, this paper offers a detailed analysis of how advanced HDLC film synthesis and surface engineering contribute to enhancing performance and functionality. The discussion emphasizes the transformative potential of these materials in improving mechanical, thermal, and electronic properties. This review serves as a comprehensive resource for researchers and engineers, presenting a synthesis of recent advancements that inform both academic inquiry and practical applications. It encapsulates the evolving landscape of HDLC thin films and surface modification strategies, inspiring further innovation and supporting breakthroughs in science and technology. Through this analysis, the review underscores the pivotal role of advanced material processing in driving future technological advancements.

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Personal Profile

Hari Shankar Biswas is Assistant Professor in Chemistry Surendranath College, Kolkata. Dr. Biswas is an esteemed Assistant Professor in Chemistry at Surendranath College, Kolkata, with a multifaceted academic background and a strong dedication to research and education. He embarked on his academic journey by obtaining his B.Sc. degree in Chemistry Honours from R.K.M.V.C. College in 2005, followed by his M.Sc. degree from Presidency College, Kolkata, in 2008. Dr. Biswas further pursued his scholarly pursuits by earning a Ph.D. in Material Science from the Saha Institute of Nuclear Physics, University of Calcutta, in 2015. His professional experience spans various roles, including a stint as a School teacher at Keshub Academy, Kolkata, from 2008 to 2010, before transitioning into academia as an Assistant Professor at Surendranath College. Dr. Biswas specializes in the research domain of Carbon thin Film, Graphene, and Graphene Oxide-based nano Composites, focusing on their synthesis, characterization, and application across Environmental, Biological, and Technological fields. Dr. Biswas's scholarly contributions are significant, with authorship of 17 book chapters and over 30 papers published in esteemed International Journals. He is actively involved in academic societies, holding life membership in the Indian Science Congress Association and the Indian Chemical Society, along with an affiliated membership with the Royal Society of Chemistry. In addition to his research and academic endeavors, Dr. Biswas plays a vital role in the dissemination of scientific knowledge as a series book Editor (11 books edited) and reviewer for reputable international publishers and journals. He serves as an Editorial board member for the American Journal of Chemical Engineering, Reseapro Journal, Lincoln University College, etc., and is affiliated with Rotary International. Dr. Biswas's editorial contributions extend to editing various books, including titles such as “Emerging Concepts in Chemical and Biological Science” and “Modern Approaches in Chemical and Biological Sciences,” among others. Through his comprehensive involvement in research, education, and editorial responsibilities, Dr. Hari Shankar Biswas continues to make valuable contributions to the field of Chemistry, fostering advancements and innovations for the betterment of society.

Dr. Hari Shankar Biswas
Department of Chemistry, Surendranath College, 24/2, Mahatma Gandhi Road, Kolkata-09, India.

IL-44

Metal free Perylene based Organocatalyst for electrocatalytic hydrogen generation

Poulami Hota[a]*, Aranya Das[b], Dilip K. Maiti[b]
[a]*Milli Al-Ameen College (For Girls), 43, Beniapukur Ln, Beniapukur, Kolkata-700014, India*
[b]*Department of Chemistry, University of Calcutta, 92, A. P. C. Road, Kolkata-700009, India*
E-mail: dkmchem@caluniv.ac.in

Abstract

Molecular hydrogen is the cleanest fuel due to its high energy density (about 142 MJ kg^{-1}) and environmental friendliness since it produces water as a combustion byproduct. Electrochemical water splitting in the presence of an electrocatalyst is a promising method for hydrogen production[a]. An electrocatalyst decreases the process's kinetic barriers and allows the reaction to proceed at high current densities. Mostly used electrocatalysts often incorporate expensive metals, such as platinum, making them unsuitable for large-scale use[b]. Organocatalysts may be utilized as useful alternatives to metal based electrocatalysts. Organocatalysts are small organic compounds that catalyze reactions without relying on metals or metal ions. perylene diimide (PDI) based compounds are the most prospective classes of organic compounds, having a wide range of potential applications including electronic applications, organic solar cell, sensors, cathode materials for batteries[c] etc. The presence of delocalized π electron density of the perylene core and reversible redox active carbonyl sites make PDI based compounds potential material for various electrochemical applications. In the present work, to explore this perylene di-imide based compounds (PDI-1, PDI-2, PDI-3) are synthesized and studied for their electrocatalytic hydrogen generation activity in acidic solution. PDI-3 shows the best electrocatalytic activity with lowest onset potential and the integrity of the catalysts is maintained for at least 24 h of electrocatalysis in aerobic atmosphere. The incorporation of a large number of perylene units in PDI-3 facilitates better electron transportation during proton reduction and also enhancing quantity of carbonyl units accelerate the hydrogen adsorption-desorption process via keto-enol tautomerization making PDI-3 a superior electrocatalyst for hydrogen production. As one of the rare hydrogen-evolving organo-electrocatalysts, this work ventures into uncharted territory to expand catalyst diversity and explore new charge transport pathways.

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Personal Profile

Dr. Poulami Hota obtained her Ph.D. in 2020 from IACS, Kolkata under the guidance of Professor S. K. Saha. After postdoctoral studies with Prof. Dilip Kumar Maiti at Calcutta University (2020-2023), she started her independent career as Assistant professor in Chemistry in Milli Al-Ameen College (for girls) in 2024. She was also working as visiting faculty at Lady Brabourne College.

Awards

CSIR-JRF Fellowship
CSIR-SRF Fellowship
CSIR-RA Fellowship
Best poster award on National Conference on Recent Development in Nanoscience and Nanotechnology, 2019.
Best poster award on International conference on chemistry for human development (ICCHD-2020)

Dr. Poulami Hota,
MILLI AL-AMEEN COLLEGE (For Girls)
E-mail: dkmchem@caluniv.ac.in

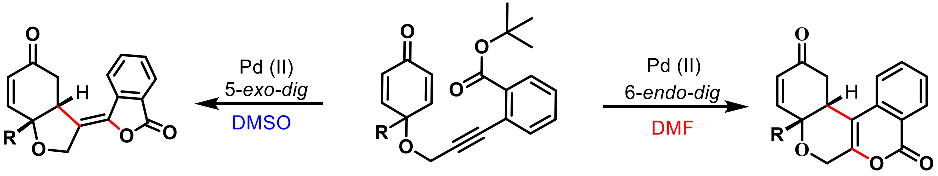
Oral Presentations:

OP-01

Palladium (II)-Catalyzed Desymmetrization of 2-Alkynylbenzoate Tethered Cyclohexadienones for the Synthesis of Polycyclic Compounds

Archana Rai, Priyam Bajpai, Gamidi Rama Krishna, Kumar Vanka and Utpal Das *
Division of Organic Chemistry, CSIR-National Chemical Laboratory, Pune 411008, India.
Academy of Scientific and Innovative Research (AcSIR), Ghaziabad 201002, India.
*email id: * ardas66@rediffmail.com, ardchem@caluniv.ac.in*

Abstract:
Pd-catalyzed cascade cyclization of 2-alkynylbenzoate tethered cyclohexadienone were developed for the single step synthesis of isocoumarin-fused dihydrochromenones. This highly atom economical method proceeds via 6-*endo-dig* cyclization of *tert*-butyl benzoate with tethered alkyne. By modulating the reaction solvent and metal catalyst, the methodology was diverted for the purposeful synthesis of either of *E/Z* tetra-substituted alkenes.



OP-02

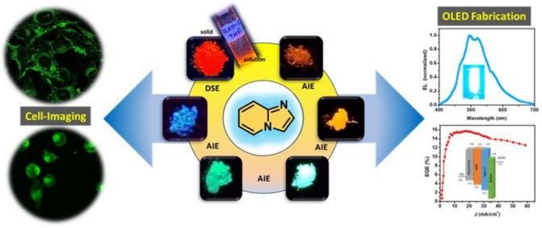
Molecular Engineering Of Imidazo[1,2-A]Pyridines: As Gateway For Dual State Emissive Molecules For Optoelectronics And Bioimaging

Chinmay Thakkar,[1] Gauravi Yashwantrao,[1] Seemantini Kale,[1] Dr. Sangita Bose,[2] Dr. Rohit Srivastava,[3] Dr. Satyajit Saha*[1]
[1]Department of Specialty Chemicals Technology, Institute of Chemical Technology, Mumbai- 400019,
[2]CEBS, University of Mumbai, Mumbai, Maharashtra, India
[3]IITB, Biological Science and Bioengineering Dept, Mumbai, India
email id: ss.saha@ictmumbai.edu.in

Abstract
Luminescent dyes represent a pivotal class of compounds with versatile scaffolds, offering immense potential across various applications.[1-5] These dyes, characterized by properties such as Dual State Emission (DSE) and Aggregation Induced Emission (AIE), are highly coveted for their utility in optoelectronics, bioimaging, sensors, and polymeric materials. However, the realization of these properties often entails intricate structural designs and complex synthetic routes.

In this study, we introduce a series of luminescent molecules based on the imidazo[1,2-a]pyridine framework, meticulously synthesized and structurally engineered to exhibit both DSE and AIE properties. Photophysical investigations reveal that these compounds emit across a broad spectrum of the visible range, from blue to red, with exceptional quantum yields. The solid-state luminescent properties were further examined by fabricating OLED devices for optoelectronic applications. These devices demonstrated promising results, achieving high External Quantum Efficiencies (EQEs) with minimal roll-off.

Furthermore, the AIE properties of these compounds were explored for bioimaging applications. The luminogens effectively penetrated cancer cells, binding to both the nucleus and cytoplasm with high fluorescence intensities. This work provides a strategic approach for researchers to design novel luminescent materials through structural engineering, paving the way for a wide range of applications.



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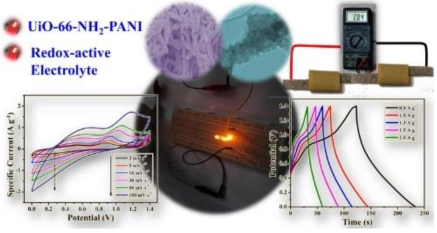
OP-03

High-Performance Aqueous Redox Supercapacitor based on UiO-66-NH_2-Polyaniline Composite

Krishna Chattopadhyay, Dilip Kumar Maiti*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata 700009, India
e-Mail: krishchem001@gmail.com; dkmchem@caluniv.ac.in

Abstract

Sustainable and green energy resources are urgently needed to compensate for the widespread use of portable electronic gadgets in modern daily life, as fossil fuels are dwindling. Electrochemical capacitors, or supercapacitors, offer a solution, exhibiting high power density, moderate energy density, and excellent cycle stability. Metal-organic frameworks (MOFs) are promising electrodes materials for supercapacitor due to their high surface area and tunable pore structure. However, their practical use is hindered by poor conductivity. To address this problem, a novel composite material was developed by integrating the metal-organic framework (MOF) UiO-66-NH_2 with the conducting polymer polyaniline (PANI). The composites exhibited enhanced electrochemical performance, achieving a high specific capacitance of 462.2 F g^{-1}. Further optimization with redox additive $K_4[Fe(CN)_6]$ resulted in an enhancement of specific capacitance upto 859.5 F g^{-1}. An aqueous symmetric supercapacitor device was fabricated, achieving a high specific capacitance of 252.3 F g^{-1}, a specific energy of 68.7 W h kg^{-1}, and a specific power of 2.24 kW kg^{-1}. The device showed good electrochemical stability and was able to power yellow LEDs (~2 V), showcasing its practical application.



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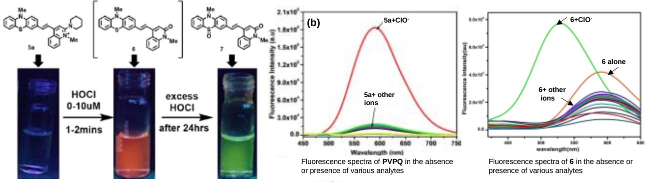
OP-04

Phenothiazine-Quinolinium based “Turn-on” Fluorescent Probes for Selective Detection of Hypochlorite Ion

Nisha Gupta, Sajiya Parveen, Suchitra Gupta and Atul Goel*
Department of Chemistry, CSIR-Central Drug Research Institute, Lucknow-226031, India
e-mail: nishagupta1433269@gmail.com

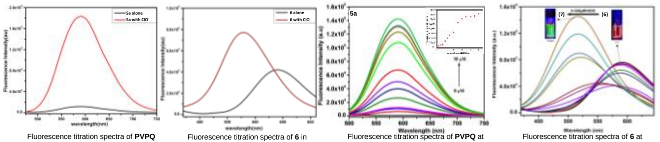
Abstract

Hypochlorite/hypochlorous acid (ClO^-/HOCl) is a critical reactive oxygen species (ROS) with significant roles in biological systems, particularly due to its potent antibacterial activity. However, elevated levels of ClO^- can lead to oxidative tissue damage, underscoring the necessity for precise and efficient detection methods. To date, many fluorescence probes based on different fluorophores including benzothiazole, coumarin, phenothiazine, etc. have been reported for the detection of ClO^-, but many of these fluorescent probes suffer from severe limitations such as complex synthetic pathways, long response times, weak water solubility, working in high pH conditions, poor detection limits, and excitation or emission in the ultraviolet region.[1-3] Herein, we report the rational design and synthesis of a novel phenothiazine-quinolinium-based “turn-on” fluorescent probe, 5a **(PVPQ)**, tailored for the selective and sensitive detection of ClO^-. The probe exhibits remarkable optical properties, including a large Stokes shift (~197 nm), excellent photostability, and operational stability across a broad pH range. Notably, **PVPQ** demonstrates high sensitivity with a detection limit of 63 nM and a dynamic response range of 0–10 μM, alongside exceptional selectivity for ClO^- over competing analytes. This study introduces a novel mechanistic framework for hypochlorite detection and establishes **PVPQ** as a promising tool for applications in biological and environmental monitoring.[4]



Fluorescence spectra of **PVPQ** in the absence or presence of various analytes

Fluorescence spectra of **6** in the absence or presence of various analytes



Fluorescence titration spectra of **PVPQ** in absebce and presence of HClO

Fluorescence titration spectra of **6** in absebce and presence of HClO

Fluorescence titration spectra of **PVPQ** at different concentrations of HClO

Fluorescence titration spectra of **6** at different concentrations of HClO

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3. S. Wang, B. Zhu, B. Wang, X. Cao, L. Zhu, Zeng, L. *Chin. Chem. Lett*. **2021**, *32*, 1795;
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OP-05

Anion-Assisted Supramolecular Polymerization of Luminescent Organic π-Conjugated Chromophore in Moderately Polar Solvent: Tunable Nanostructures and Corresponding Effect on Electronic Property

Sk Sujauddin, Sk Mursed Ali, Mijanur Rahaman Molla*
Department of Chemistry, University of Calcutta, 92 A P C Road, Kolkata, India-700009
E-mail: *sujask053@gmail.com*, *mrmchem@caluniv.ac.in*,

Abstract

Supramolecular polymers of π-conjugated organic chromophores have emerged as promising candidates in organic electronics because of their dynamic and highly ordered molecular organization. Herein, we demonstrate formation of luminescent, highly conducting supramolecular polymers of functionalized naphthalimide π-chromophore based organic semiconductor in moderately polar organic solvent (Tetrahydrofuran) by overcoming solute-solvent H-bonding in assistance with the fluoride anion. The polymerization is exclusively guided by the synergistic effect of cascade H-bonding (F-...H-N- of primary amine followed by -C=O...H-N- of amide), π-π stacking and hydrophobic interactions. The increasing molar equivalents of anion leads to morphology transition from 1-D nanowires to 2D-nanosheets via nanotubes and nanorings, but above a particular threshold of the same anion, depolymerization mediated disruption of long range order and formation of non-luminescent spherical particles was observed. Such significant impacts of anion in supramolecular polymerization-depolymerization were utilized in modulating the electronic properties of this naphthalimide based organic semiconductor.

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OP-06

Anti-Parkinson potential of a polyphenol-enriched fraction obtained from *Butea monosperma* dried flowers

Tripti Mishra[a] and Bhuwan B. Mishra [a*]
[a]Center of Innovative and Applied Bioprocessing (CIAB), Sector 81 (Knowledge City), Mohali-140306, Punjab, India

Abstract

Natural polyphenols are known to possess immense therapeutic potential and hence, are an important starting point for drug research. The present study has been conducted with the explicit objective of preparing a polyphenol-enriched fraction from the flower petals of *Butea monosperma* (Lam.) Kuntze (common name: Palash) followed by complete characterization of its marker compounds. The enriched fraction contains majorly two natural polyphenols, a chalcone glycoside, and a flavanone glycoside. Subsequently, the obtained fraction has been investigated for its neuroprotective potential against Parkinson's disease. The findings suggest the significant efficacy of the enriched fraction and its outstanding potential to serve as a lead to finding a potent anti-Parkinson agent from an abundantly available natural source.

Keywords: Palash, Chalcone glycoside, Flavanone glycoside

OP-07

Triterpenoids isolated from Holarrhena pubescens induce apoptosis in bladder cancer cells through differential reactive oxygen species generation

Anindita Ghosh, Rituparna Roy, Essha Chatterjee, Biswabandu Bankura, Santosh Guru and Chinmay Kumar Panda*
Department of Oncogene Regulation, Chittaranjan National Cancer Institute, Kolkata-700026, W.Bengal, India
Email: aninschem@gmail.com

Abstract

A novel triterpenoid, holarol,3β-lup-20(31)-en-3,29,30-triol along with dihydrocanaric acid and betulin were isolated from the seed pods of Holarrhena pubescens (L.)Wall.(Apocyanaceae) (Hindi: Kurchi). The structures of the compounds were elucidated by extensive spectral analysis.

In the present study, we have experimentally and theoretically studied the free-radical quenchingactivities and also cytotoxicity of the compounds by SRB assay. The compounds showed differential sensitivity towards the cancer cell lines with highest cytotoxicity against the bladder cancer cell line T24. The compounds showed reactive oxygen species generation in T24 cell line resulting in induction of apoptosis through cleavage of PARP, caspase 3 and increasing Bax/Bcl2 ratio. Hybrid molecules were designed by combining the isolated active molecule with known drugs to extend the range of therapies in oncology using the concept of "old drug, new trick" [1]. In this synthetic approach we have linked the natural product molecule with an anticancer/anti- inflammatory drug through a cleavable bond so that the parent molecules could be released simultaneously depending upon the conditions in the active site of target. These molecules are designed in a way that they have synergistic effects on cancer cells to overcome the drug resistance and also to reduce the side effects of the anticancer drugs in use.

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OP-08

Dual-Emissive Iridium (III) Complex with Aggregation-Induced Emission: Mechanistic Insights into Electron Transfer for Enhanced Hypoxia Detection in 3D Tumor Models

Annu Agarwal[a], Shrikant Kirwale[b], Ajeet Singh[a], Bharat Kaushik[a], Vishal Kachwal[a,c], Aniruddha Roy[b]*, Inamur Rahaman Laskar[a]*
Department of Chemistry, BITS Pilani, Pilani Campus, Rajasthan, Pilani-333031, INDIA

e-mail: ir_laskar@pilani.bits-pilani.ac.in

Abstract

Accurate oxygen detection is vital in biological and industrial applications, necessitating highly sensitive and reliable sensors.[1a,b] Optical sensors, valued for their real-time monitoring, non-destructive analysis, and exceptional sensitivity, are particularly suited for precise oxygen measurements.[1c] Here, we report a dual-emissive iridium (III) complex, $IrNPh_2$, featuring 'Aggregation-Induced Emission' (AIE) properties and optimized for oxygen sensing. $IrNPh_2$ exhibits dual emissions at 450 and 550 nm, with the 550 nm triplet-state emission demonstrating remarkable oxygen sensitivity due to its long-lived excited state (15.1 μs) and high quantum yield (68%). Stern-Volmer analysis reveals a notable quenching constant ($K_{sv} = 11.79\ \%^{-1}$) and an ultra-low detection limit of 0.0397%, emphasizing its superior performance. The oxygen quenching mechanism is driven by electron transfer (ET), supported by computational studies showing LUMO alignment of $IrNPh_2$ with the π_g^* orbitals of triplet oxygen, leading to superoxide radical ($O_2^{\bullet-}$) formation.[1d] Electron paramagnetic resonance (EPR) studies confirm this pathway. Biological evaluations using a 3D U87-MG glioma spheroid model highlight $IrNPh_2$'s ability to detect hypoxic regions, with significant fluorescence enhancement under hypoxia and minimal cytotoxicity (>80% viability at 100 μM). With high sensitivity, low detection limits, and biocompatibility, $IrNPh_2$ emerges as a promising candidate for oxygen sensing in environmental and biomedical applications, especially tumor hypoxia detection.

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OP-09

Polyurethane based Crosslinked Nanoassemblies: A Rout to Cocktail Drug Delivery for Cancer Therapy

Soumya Kolay, Mijanur Rahaman Molla*
Affiliation: Department of Chemistry, University of Calcutta, Kolkata, India-700009
mrmchem@caluniv.ac.in

Abstract

Supramolecular nanoassemblies based on polymers are of great interest for anticancer treatment because they can stably encapsulate drug molecules and release them in response to specific stimuli.[1] In the realm of drug delivery, core-crosslinked micelles have garnered significant attention due to their superior colloidal stability, biocompatibility, efficient drug loading, stimulus control, and prolonged release compared to other nanoassemblies. Here, we have designed and synthesized an amphiphilic polyurethane with a GSH-responsive disulfide bond, which was then cross-linked using reducing agent, dithiothreitol (DTT) in a straightforward thiol-disulfide exchange reaction.[2] The kinetics were tracked by measuring the intensity of absorption of release pyridine-2-thiol during cross-linking, and the reaction conditions were mild and did not require any organic solvents or metal-containing catalysts. Here the degree of crosslinking would regulate the drug release kinetics. The FT-IR, GPC, and ^1H NMR investigations were used to characterize the polymer structure. The *in vitro* dual release of anti-cancer drug, doxorubicin (DOX) and camptothecin (CPT) [3] from the micelles was observed when nanoasseblies were treated with reducing agent, glutathione (GSH) at a cytosolic concentration (10 mM). Fluorescence Resonance Energy Transfer (FRET) experiment have demonstrated the stability of the guest encapsulation within the nanoaggregate and the tunability of guest molecule release. To illustrate how a dual drug delivery system increases the efficiency compared to the single drug delivery, a cancer cell line was used and on the other hand, as a control, a normal cell line was used. We believe the cocktail drug delivery would offer a viable and effective approach to cancer treatment.

The detail polymer synthesis, characterization, fabrication of crosslinked nanoassemblies, drug loading, triggered release and biological evaluation will be the topic of this presentation.

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OP-10

Synthetic Protocol Dependent Terbium-Lead Co-Dopant Electronic Interaction in Zinc Sulfide Nanoparticles for Photoluminescence Based Application

Nayan Bhunia,[1] and Prasun Mukherjee[1,*]
Centre for Research in Nanoscience and Nanotechnology, University of Calcutta, JD2, Sector III, Salt Lake, Kolkata - 700106
Email: *nayanbhunia8836@gmail.com; pmcrnn@caluniv.ac.in*

Abstract:

Trivalent lanthanide (Ln^{3+}) containing luminophores are gaining attraction due to their unique properties associated with multiple narrow well-separated emission bands with large stokes shift and longer lifetime.[1] They can be potential candidates as alternative luminophores. Incorporation doping of multiple dopants in inorganic nanoparticles (NPs) provides an opportunity to generate multiplex assays.[2] The co-dopant can induce electronic "cross talk" and/or tune the structural network of the NP's core and surface. The Pb^{2+} co-doping enhances the Tb^{3+} emission in trivalent terbium-doped zinc sulfide [Zn(Tb)S] NPs.[3] The Tb^{3+}–Pb^{2+} spatial proximity and a favorable co-dopant electronic energy level alignment contribute toward this emission brightening. This work tests the performance of the Tb^{3+} emission in the Zn(TbPb)S and Zn(Tb)S/Pb NPs, where dopants within parentheses and after slash indicate their synthetic and postsynthetic doping, respectively.[4] The steady-state and time-resolved photoluminescence, photoelectron spectroscopy, zeta potential, and infrared absorption of surface capping ligands identify important differences between the two systems investigated. The Zn(TbPb)S NPs emerge as a superior sensitizer to generate Tb^{3+} emission through a core dominant Tb^{3+}–Pb^{2+} electronic interaction compared to a surface dominant Tb^{3+}–Pb^{2+} interaction in Zn(Tb)S/Pb NPs. This doping strategy guided NP design principle help to control lanthanide emission, which expands the palette of lanthanide-based NP luminophores for practical applications such as bio-imaging, sensing, optoelectronics. The usefulness of this material for Pb^{2+} sensing in aqueous media is tested in presence of co-existent Hg^{2+} that is either doped synthetically or postsynthetically.

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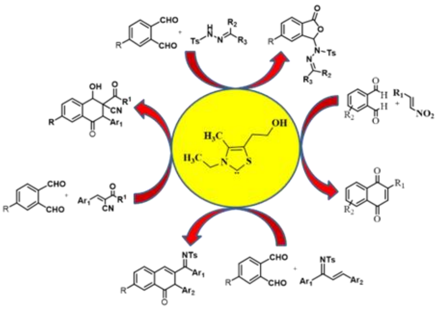
OP-11

N-Heterocyclic carbenes (NHCs) are versatile organocatalyst towards cyclization to new molecules

Debabrata Barman, Dilip K. Maiti,*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata, 700009, India.
E-mail: dkmchem@caluniv.ac.in

Abstract:

In the modern area of research syntheses of new molecules are highly valuable in both medicinally as well as biologically. By the employment of appropriate reagents, catalysis and mild reaction set up afforded high to excellent yields towards reaction sequences. The N-heterocycle carbenes (NHCs) are novel and versatile organocatalyst for the construction of new molecules by the formation of new C-C, C-O, and C-N through cyclization. NHC-catalyzed dual Stetter cascade reaction is discovered through coupling of β-nitrostyrene with phthalaldehyde under mild conditions to furnish valuable arylnaphthoquinones. Bioactive α- tetralone moieties have great importance in pharmacology. The development of a high yielding cascade reaction is discussed to achieve a wide variety of substituted α-tetralones catalysed by NHC as a unique and powerful organocatalyst. The formal [4+2] annulation products were derived by using NHC to the reaction with phthalaldehyde and (*E*)-ethyl-2-cyano-3-phenylacrylate. The discovery new C-N bond forming cyclization for the construction of hemiaminal phthalidyl ester derivatives are potent biologically important molecules when NHC employed under mild open air reaction condition.



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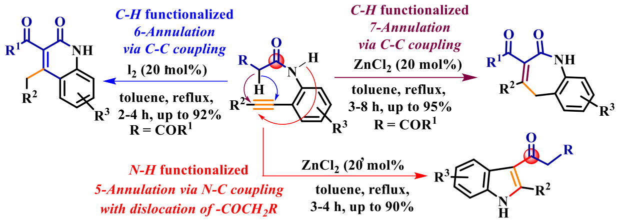
OP-12

Efficient Hybrid Heterocycle Synthesis from 2-Ethynylaniline via Carboamination and Annulation Reactions

Sk Ajarul[a]
[a]Government General Degree College at Salboni, Bhimpur, Paschim Medinipur-721516, India

Abstract:

Recent advanced strategies for the functionalization of carbon–carbon triple bonds in alkynes through the direct addition of carbon–hetero atom bonds. A selective Lewis acid catalysed C–C and C–N cross-coupling reaction using 2-ethynylanilides enables the synthesis of functionalized benzo[b]azepinones, 2H-quinolinones, and 3-acylindoles in high yields. ZnCl2 was found as the smart catalyst for 7- and 5-annulation whereas molecular iodine performed the C-H functionalized 6-annulation with nonconvensional path way. Additionally, Bronsted acid catalysis has been used to construct valuable fused-N-heterocycles, including isoindolo-, pyrido-, pyrrolo-quinolinediones, and isoindolo-indolones, via annulation reactions with cyclic anhydrides or o-formylbenzoates. Lastly, an efficient Ag(I)-catalyzed indolyzation, coupled with Friedel–Crafts alkylation through cascade cyclization, facilitates the synthesis of hybrid heterocycles.



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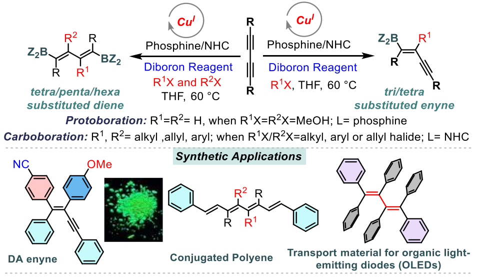
OP-13

Copper(I)-Catalyzed Proto/Carboboration of 1,3-Diynes: An Easy Access to Borylated Enynes and Dienes

Suman Ghosh, Rajesh Chakrabortty, Shailendra Kumar, Venkataraman Ganesh*
Department of Chemistry, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal -721302
E-mail: ghoshsuman461@gmail.com, ganesh.v@chem.iitkgp.ac.in

Abstract:

Targets with high structural complexity can be easily assembled using small, modular building blocks similar to a 'Lego' construction using Iterative chemistry. Organoboron compounds have been in the spotlight as versatile building blocks in natural product synthesis. Here, we present a regioselective protoboration of 1,3-diynes using a stable diboron source and Cu(I)/phosphine as a catalyst to access enynyl and dienyl boronate esters in a single operation. Then, the first copper-catalyzed carboboration of 1,3-diynes was developed, in which a simultaneous C−B and C−C bond formation was achieved in a single operation using Cu(I)/NHC catalyst. The methodology provides easy access to highly sterically encumbered penta- and hexasubstituted dienes. Then, aryl halides were used to access aryl decorated enyne and diene diboronates regioselectively. An iterative Suzuki coupling of the products provided arylated enynes and highly conjugated trienes and tetraenes. DFT studies supported the regioselective incorporation of electrophiles.



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OP-14

Deep Learning and Nanotechnology: A Promising Avenue for the Human Lung Carcinoma Cells Classification and Diagnosis

Sourajit Maity*, Moupiya Ghosh, Subhankar Guha
Department of Computer Science and Engineering, Jadavpur University, Road, Kolkata, INDIA
Department of Computer Science and Engineering, Sister Nivedita University University, Road, Kolkata, INDIA
Department of Computer Science and Engineering, Techno International Batanagar, Kolkata, India
Department of Physics, Basic Science & Humanities, Institute of Engineering and Management (IEM), Kolkata, University of Engineering and Management, Newtown, Kolkata, West Bengal 700160, India
e-mail: sourajit.cse.ju@gmail.com

Abstract:

To diagnose lung cancer in its early stages and to track the disease while it is being treated, medical imaging technologies are crucial. Numerous medical imaging modalities have been thoroughly investigated for the detection of lung cancer, including molecular imaging approaches, chest X-rays, magnetic resonance imaging, positron emission tomography, and computed tomography. Among the drawbacks of these methods is their inability to automatically classify cancer images, making them inappropriate for patients with other diseases. The development of an accurate and sensitive method for the early detection of lung cancer is critically needed. With quickly developing applications across medical image-based and textural data modalities, deep learning is one of the medical imaging fields with the quickest rate of growth. Clinical professionals may identify and categorize lung nodules more rapidly and precisely with the use of deep learning-based medical imaging technologies. This study proposes a deep learning method for lung carcinoma cells [1a] detection that uses transfer learning-based snapshot ensemble technique. Therefore, the primary goal of this study was to validate and identify the best model for determining the prevalence of lung cancer disease using DL techniques and classification models. In this research, we used the LC25000 [1b] and Chest CT-scan images datasets [1c] along with some transfer-learning-based models incorporating the CBAM attention mechanism and used Snapshot Ensemble based Deep Learning Neural Network. After the successful classification of human lung carcinoma cells, we have also tried to develop a nontoxic nanocarrier for the successful delivery of a novel drug with enhanced efficacy against human lung carcinoma cells. A magnetic spinel ferrite nanocarrier has been developed and conjugated with the drug Ketoconazole (an antifungal drug) and the drug conjugated nanoparticles have been applied against the growth of the lung carcinoma cells. The drug shows a significantly enhanced anticancer activity after its conjugation with the nanocarrier. This study shows a new perspective in biomedical research for both the detection and treatment of lung cancer disease with enhanced efficacy and minimum side effects.

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OP-15

Different device applications based on PDI acceptors

Soumyadeep Mitra [1]*, Sudipta Ray[2] and Dilip K. Maiti[3]
1 Department of Physics, Brainware University, Barasat, Pin-700125, India
2 A. K. Mitra Instiution for Girls, Dhakuria, Kolkata-700031, India
3 Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: dkmchem@caluniv.ac.in, dsm.ph@brainwareuniversity.ac.in

Abstract:

Perylenediimide based materials generally are soluble and air stable materials that can be tuned to get semiconducting property. A new material ANTPABA-PDI has been synthesized and utilized as an non fullerene acceptor in fabrication of inverted organic solar cells. In that fabrication P3HT has been used as donor material along with ANTPABA-PDI acceptor to deposit bulk heterojunction active layer. The power conversion efficiency of the as fabricated inverted structured solar cell is 1.7%. The fabrication and characterization process has been performed in open atmosphere. By increasing the conjugation in PDI moiety another symmetric PDI based compound has been designed and synthesized. This PDI based organic nanomaterial has been used as an acceptor material along with P3HT as donor to check its photoactivity and it has come out to be a suitable acceptor material for fabricating organic photodiode. The device structure of this photodetector is also inverted with ZnO as buffer layer. For both cases, the inverted structure reduces the recombination rate. In case of this photodiode, a very small amount of current (~nm) flows when the device is illuminated under solar simulator.

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OP-16

Phyto-Pharmacognostical and Analytical Investigations of some Indigenous Medicinal Plants and Formulations

Manosi Das*, Sudipto Debnath, Rajesh Bolleddu and Gajji Babu
Central Ayurveda Research Institute, CCRAS, 4 Minerva Road, CN Block, Sector V, Bidhannagar, Kolkata – 700091
E-mail: manosi_das@rediffmail.com

Abstract:

In the last few decades, medicinal plant products have taken a significant share of healthcare products in the global context. Herbal medicinal products are complex mixtures. Hence, detailed chemical and pharmacognostical analysis of the individual medicinal plants, and quality control and standardization of formulations are of vital importance. A large number of Indian medicinal plants, which are well-reputed in the traditional Indian medicinal system of Ayurveda, are being investigated at the Institute. The work involves phytochemical and pharmacognostical studies of the medicinal plants; extraction, isolation and characterization of potentially bioactive compounds; drug standardization studies by means of spectroscopic and chromatographic studies. The present communication presents the results of some of our recent investigations of *Hemidesmus indicus* roots (*Anantamul*), *Moringa oleifera* leaves (*Shigru*), *Ailanthes excelsa* (*Mahanimba*) stem bark, *Wrightia tinctoria* R. Br. (*Indrajau*) seeds, *Alstonia scholaris* roots (*Saptaparna*) and *Mikania micrantha* fresh and dried leaves (*Rabonlata*).

Triphala Kwatha Churna is an Ayurvedic drug formulation with three ingredients, *viz*. *Emblica officinalis* (*Amalaki*), *Terminalia chebula* (*Haritaki*) and *Terminalia bellirica* (*Bibhitaki*). The formulation consists of pericarps of fruits of the three plants in equal proportions. The development of Quality Control Parameters for the individual drug components and the drug formulation involved organoleptic evaluation; microscopic evaluation; physico-chemical analysis; phytochemical analysis; analysis of heavy metals, toxins, microbial contamination and pesticide residues.

OP-17

Efficient Organic Base-Driven Domino Cyclization for the Synthesis of Oxazine-6-ones and 4-Pyrimidinols

Anindya S. Manna[a], Antara Roy[a], Sandip Das[a], Nilay Karchaudhuri[b], Aparna De[c] and Dilip K. Maiti*[,a]
[a]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India.
[b]Department of Chemistry, Barrackpore Rastraguru Surendranath College, Kolkata-700120, India.
[c]Principal, South Calcutta Girls College, Kolkata-700025
**E-mail of Author for Correspondence: dkmchem@caluniv.ac.in*

Abstract:

The construction of valuable organic frameworks for applications in biological and material sciences has recently been a key focus for synthetic organic chemists. Inspired by existing literature,[1] we explored a simple, efficient, and cost-effective approach to synthesize variably substituted oxazine-6-one and 4-pyrimidinol core structures. According to reports,[2] synthetic methods for oxazine-6-ones and their precursors are limited, while strategies for pyrimidinols, including those by Vidal and others, often rely on multistep processes, harsh conditions, expensive catalysts, and low atom economy.[3]

Here, we present a novel, straightforward protocol using an organic base and additives to synthesize these heterocycles. The method employs benzimidates or benzamidines with substituted dicyano-olefins in acetonitrile under conventional heating, enabling C-N and C-O domino coupling. It is characterized by step economy, moisture insensitivity, and high yields without transition metal catalysts or hazardous reagents. Scalable to gram-scale production, this robust protocol also features a detailed mechanistic pathway supported by controlled experiments, HRMS-ESI data, and literature. This approach offers a significant advance in synthesizing biologically and industrially relevant heterocycles with potential applications in synthetic, pharmaceutical, and material sciences.

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OP-18

Inspiring Inquiry: Master Asima Chatterjee's Legacy in Interdisciplinary Science Education

Sandip Das[a], **Nilay Karchaudhuri** [b]*, Antara Roy[a], Anindya S. Manna[a], Sukla Ghosh[c], Aparna De[d] and Dilip K. Maiti [a]*
[a]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India.
[b]Department of Chemistry, Barrackpore Rastraguru Surendranath College, Kolkata-700120, India
[c]Department of Chemistry, Women's College, Calcutta, 700003
[d]Principal, South Calcutta Girls College, Kolkata-700025
**E-mail of Author for Correspondence: dkmchem@caluniv.ac.in, nilaychemistry@gmail.com*

Abstract:

Professor Asima Chatterjee's pioneering work in natural product chemistry, particularly her innovative studies on medicinal plants and alkaloid synthesis, provides an inspiring foundation for enhancing curiosity and creativity in undergraduate science education. This paper examines how her interdisciplinary research—spanning organic synthesis, medicinal chemistry, and natural products—can encourage inquiry-based, student-centered learning. By guiding students in framing meaningful research questions and blending traditional knowledge with modern scientific practices, this approach nurtures critical thinking and fosters an appreciation of chemistry's societal relevance. The integration of historical context with contemporary advancements not only enhances engagement and innovation but also promotes interdisciplinary exploration.

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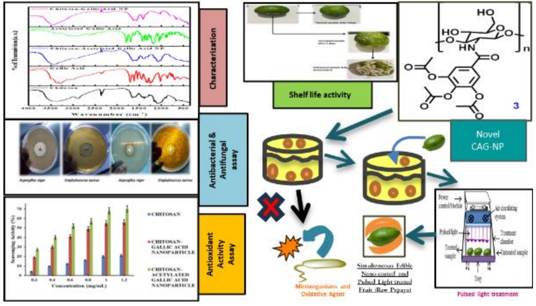
OP-19

Synergistic Preservation of Fruits and Vegetables Using Modified Biodegradable Polymer Coatings and Pulsed Light Treatment

Antara Roy[a], Anindya S. Manna[a], Sandip Das[a], Nilay Karchaudhuri[b], Dilip K. Maiti[*a] and Debasish Bandyopadhyay[*c]
[a]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India.
[b]Department of Chemistry, Barrackpore Rastraguru Surendranath College, Kolkata-700120, India.
[c]Department of Physiology, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India
*E-mail: *dkmchem@caluniv.ac.in; debasish63@gmail.com*

Abstract:

Recently, spoilage and waste of food are global challenges requiring sustainable and effective preservation approach. This research work based on the effective preservation efficiency of a combined treatment of novel edible food coating made by using chitosan-acetylated gallic acid nanoparticles (NPs) and pulsed light (PL) treatment. A novel modification was made in chitosan biopolymer with acetylated gallic acid to enhance its antioxidant, antimicrobial, and film-forming properties as well as its performing stability. The synthesized nanoparticles were characterized in terms of size, morphology, and functional groups using advanced techniques. The coating was applied to perishable food models, followed by exposure to pulsed light treatment to improve the antimicrobial efficacy and adhesion of the coating. PL treatment demonstrated a synergistic effect, significantly reducing microbial growth and retaining the food qualities such as texture, color, and flavor. The integration of biodegradable materials and energy-efficient PL technology ensures environmental sustainability. Storage conditions revealed extended shelf life of treated foods samples compared to untreated food sample controls, with enhanced resistance to spoilage.This study points towards the potential of chitosan-acetylated gallic acid NPs and PL as an ideal substitute for the current traditional preservatives and the effectiveness of our unique nanoparticles in preserving and improving the quality of post-harvest fruits and vegetables, which could attract a lot of interest in commercial post-harvest applications.



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OP-20

Investigation of Supramolecular Interactions and their Applications in Activation of CO_2

Nidhi Kumari[1] , Supriyo Halder , Sanjib Ganguly* , Kausikisankar Pramanik* , Wolfgang Schöfberger* , Soumyajit Roy[1]*
1EFAML, Materials Science Centre, Department of Chemical Sciences, IISER-Kolkata, India e-mail:
nk20rs002@iiserkol.ac.in &s.roy@iiserkol.ac.in

Abstract:

Sustainability is a process by which we ensure economic and social growth while maintaining ecological balance. [1] In 1990, the term 'Sustainability' started awakening the people when industrial development impacted our mother Earth.[2] In 2015, the UN set 17 Sustainable Development Goals that include generating affordable and clean energy, innovation and infrastructures, climate action, protecting the environment, and making people enjoy their lives in peace and prosperity by 2030.[3]

Herein, our group breakthrough came with the development of Soft-oxometalates (SOMs) in water dispersions. Condensation polymerization is a known reaction in coordination chemistry. Extensive condensation of a metal-oxo salt leads to the formation of extended networks in a dispersion commonly known as sols. These are colloidal states of oxometalate, having diffused boundaries known as Soft-oxometalates which open avenues for a wide range of applications in catalysis, active matter, water oxidation, and CO2RR. [4]

Continuation to CO2RR recently explored metal-free catalyst for the conversion of CO_2 to C_2 and C_3 products. Reduction of CO_2 to value-added products is a promising field to develop green technology for renewable energy. This study presents a groundbreaking pathway for the direct conversion of carbon dioxide into C_3 products through an innovative coordinatively fluxional electro-active pre-catalyst and contributes to the development of renewable and sustainable eco-friendly systems. However, the conversion of CO_2 into a value-added chemical such as C_2 and C_1 using a metal-free-electrocatalyst is still a challenge. Designing and selecting efficient organic catalysts other than existing traditional transition metal complexes is key importance for developing sustainable renewable systems. Herein, we engross Diazo-based organic bulky ligand that has low lying π^* (LUMO) that can conveniently accept an electron from the electrochemical environment on applying potential. This Diazo-based ligand is used as an electrocatalyst that reduces on applying potential to triplet diradical that acts as a nucleophile and forms an adduct with CO_2 in an aqueous medium. The formyl radical coupled further to form acetic acid and acetone with FE 19.6 %, and 24.2 % respectively at pH 5.5. Further, we propose a possible mechanism pathway by using in-situ UV-Vis. Spectroscopy and DFT study.[5].

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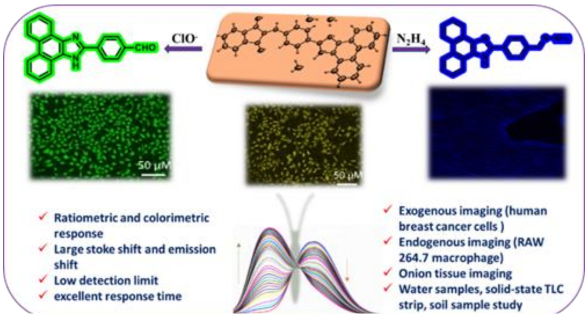
OP-21

A Dual-Responsive Ratiometric Fluorescent Probe for the Detection of Hypochlorite and Hydrazine in Environmental Samples, Live Cells, and Plant Tissue

Dipanjan Banik, Ajit Kumar Mahapatra*
Indian Institute of Engineering Science and Technology, Shibpur
email: dipanjanbanik3@gmail.com

Abstract:

Hypochlorite (ClO^-), a potent oxidizer and disinfectant, and hydrazine, a powerful reducing agent, are widely used in daily life and various industries. However, their extensive use comes with significant risks, as they are highly toxic to the environment and human health. They have been associated with various health issues and even linked to cancer. Therefore, the simultaneous detection of hypochlorite and hydrazine is crucial for assessing their impact and monitoring the onset and progression of related diseases. A phenanthroimidazole-indandione based colorimetric and ratiometric fluorescent probe was designed and synthesized for dual channel detection of hypochlorite and hydrazine in environmental and biological samples. Probe, which showed a strong yellow-orange emission at 640 nm with a massive stoke shift of 220 nm, exhibiting excellent fluorescence change from yellow-orange to green (526 nm) in the presence of ClO^- and from yellow-orange to blue (424 nm) in the presence of hydrazine in aqueous-THF solvent system. A strong ICT, which was acting in the probe, gets weakened through ClO-mediated cleavage of the C=C bridge bond to produce aldehyde with a blue shift of 114 nm and hydrazine-induced hydrozinolysis of indanedione-moiety to form hydrazone compound with a blue-shift of 216 nm and that was also confirmed by DFT study. Not only that, the probe exhibits excellent selectivity over other ROS (reactive oxygen species) and amines with a very fast response time of 40 seconds for hypochlorite and 90 seconds for hydrazine, and high sensitivity was observed with detection limits of 10.43 nM for hypochlorite and 92 nM for hydrazine. Moreover, the probe was employed to monitor both the analytes successfully in environmental water samples and in solid-state TLC strip study, whereas hypochlorite was monitored in commercial disinfectants, exogenous bioimaging in human breast cancer cells (MDA-MB 231), and endogenous bioimaging in RAW 264.7 macrophage cells with very low cytotoxicity and good cell viability. On the other hand, hydrazine was tracked in soil samples, and confocal imaging was performed on onion tissue.



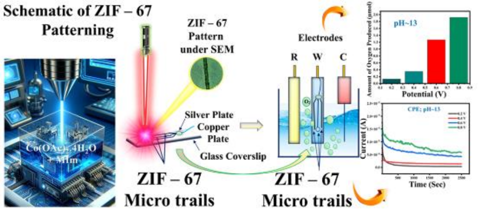
OP-22

Revisiting Water Oxidation Reaction with Micro Bubble Lithography (MBL) Printed ZIF-67 MOF Electrocatalysts

Khokan Manna[1], Anand Dev Ranjan[2], Rakesh Sen[1], Francis Verpoort[3]*, Ayan Banerjee[2]* and Soumyajit Roy[1]*
1Depart of Chemical Science, IISER Kolkata, Nadia, India, 741246
2Department of Physical Science, IISER Kolkata, Nadia, India, 741246
3State Key Laboratory of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, Wuhan 430070, PR China
*Presenter E-mail: km22rs050@iiserkol.ac.in

Abstract:

Microbubble-based micro-lithographic techniques have developed rapidly over the last ten years and are capable of reproducibly patterning a wide variety of soft materials and colloids, including polymers, metals, and proteins. Zeolitic imidazolate framework (ZIF) materials have attracted a great deal of research and application interest in the field of materials science because of their chemical and thermal stabilities.[1] Furthermore, ZIF-67 have demonstrated significant potential for applications in gas adsorption, molecule separation, electrochemistry, and catalysis,[2] which when converted into "lab-on-a-chip" platforms might produce remarkable and diverse application-oriented outcomes. This is due to their highly adjustable nanostructures. Using $Co(OAc)_2.4H_2O$ and $Co(NO_3)_2.6H_2O$ as the metal ion sources and 2-methylimidazole as the ligand, we have attempted to design ZIF-67 (composed of Co^{2+} ions and imidazolate ligands). Inspired by previous results, we used the Micro-Bubble Lithography (MBL) approach to successfully demonstrate an instantaneous in-situ green synthesis and micro-patterning of ZIF-67 MOFs in this work. We then employed Raman spectroscopy, scanning electron microscopy (SEM), and energy dispersive X-ray (EDX) analyses to characterise these micro patterns, which showed that they are made up of ZIF-67 frameworks. With reasonable stability and an over-potential of 650 mV, we have also used these micro-patterns as microelectrodes for the electrocatalytic oxygen evolution reaction (OER) in media having different pH. In addition, we have determined catalytic activity by estimating the catalysts' turnover frequency (TOF), and used the catalytic current to calculate the amount of O_2 produced since it is connected to the oxidation of water. Our work demonstrates the feasibility of using MBL to create electrocatalytic devices on small platforms. Additionally, this is the first report of patterning ZIF-67 using MBL that we are aware of. Further investigation in this area will undoubtedly open up new opportunities for the fabrication of effective CO_2RR and WOR electrocatalysts in 'lab-on-a-chip' platforms and will also enable us to incorporate these platforms in real-life devices such as metal-air batteries oxygen generators.



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OP-23

Copper contributes to adrenaline-induced oxidative and inflammatory damage in cardiac tissue: Defensive action of melatonin

Swaimanti Sarkar[1,2], Debasish Bandyopadhyay[1]*
[1]Department of Physiology, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
[2]Department of Physiology and Human Anatomy, Biswa Bangla Biswabidyalay, Bolpur, West Bengal- 731204, INDIA
*Corresponding Author (e-mail: dbphys@caluniv.ac.in)

Abstract:

Septic cardiomyopathy is a critical condition characterized by significant myocardial dysfunction and abrupt cardiovascular changes, often leading to cardiac arrest and death. The escalated levels of catecholamines, both naturally released and administered during treatment, contribute to the development of cardiotoxicity[a]. Moreover, sepsis causes systemic acidosis, which facilitates the release of free copper ions into the circulation[b], potentially interacting with adrenaline to aggravate cardiac damage.

Our study sought to explore the molecular mechanisms of acute adrenaline stress during sepsis-like conditions and assess the potential cardioprotective effects of melatonin. Chemically, Melatonin was found to strongly bind to adrenaline, inhibiting its interaction with copper, as evidenced by isothermal titration calorimetry. *In vitro*, the combination of adrenaline and copper led to an increase in reactive oxygen species (ROS) and initiated a proinflammatory response, ultimately causing cardiomyocyte damage, as shown by flow cytometry, immunofluorescence, western blotting, and scanning electron microscopy. Co-treatment with melatonin significantly reduced these oxidative and inflammatory effects. *In vivo*, melatonin treatment in adrenaline-exposed rats exhibited substantially low copper accumulation in the heart, reduced cell death, fewer fibrotic lesions, and marked restoration of histological alterations compared to those treated with adrenaline alone.

Together, these findings show that adrenaline, when combined with copper, exacerbates oxidative stress and inflammation, disrupting cardiac homeostasis. Melatonin exhibits potent cardioprotective effects against adrenaline-induced damage suggesting its potential as an efficient therapeutic strategy for septic cardiomyopathy.

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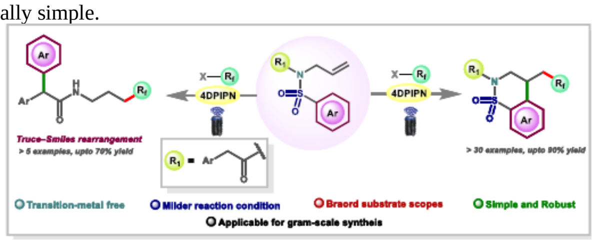
OP-24

An Organophotocatalytic Route to the Synthesis of Difluoromethyl Containing 1,2- Benzothiazine Dioxide Derivatives

Koustav Pal and Dr. Devarajulu Sureshkumar*
Department of Chemical Science, Indian Institute of Science Education and Research Kolkata, West Bengal,
India - 741246
e-mail:suresh@iiserkol.ac.in

Abstract:

Visible light photocatalysis has emerged as a transformative tool in synthetic chemistry due to its unique ability to drive chemical transformations under mild, sustainable, and environmentally friendly conditions.1 Especially Organic dyes like CzIPN derivatives have revolutionized photocatalysis, offering an eco-friendly, efficient, and versatile alternative to metal-based systems with high stability, tunable properties, and broad reaction compatibility.2 Gem-difluoromethylene, a vital research motif, enhances pharmacodynamic and metabolic profiles of small drug molecules, enabling complex fluorinated framework synthesis. Ethyl bromodifluoroacetate ($BrCF_2CO_2Et$) is a widely studied, efficient, and versatile precursor for radical-mediated gem-difluoromethylene additions to olefinic double bonds.3 Similarly, 1, 2-benzothiazine dioxide derivatives are of significant importance due to their diverse biological activities, including anti-inflammatory, antimicrobial, and anticancer properties. 4 Ongoing research into these derivatives promises to unlock new possibilities for the creation of innovative drugs and advanced materials with superior functionality. By leveraging photocatalysis, researchers can achieve a more sustainable, efficient, and innovative approach to the synthesis of difluoromethyl containing 1,2-benzothiazine dioxide derivatives, fostering advancements in both medicinal and material chemistry. Here we showcases the synthesis of 1,2-benzothiazinane dioxide derivatives containing a difluoromethyl group, using an organophotocatalyzed approach. The reaction employs readily available and bench-stable starting materials, offering a streamlined and efficient method for producing these compounds. Organo photocatalyst 4DPAIPN operates the overall radical-polar-crossover mechanistic cycle via initial oxidative luminescence quenching. The reaction is straightforward, robust, transition-metal-free, and operationally simple.



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OP-25

Exploring the Ameliorating Potential of Melatonin on Arsenic Induced Oxidative Stress Mediated Damages in Erythrocytes: A Molecular Approach

Sohini Kundu [a,b], Adrita Banerjee [a,b], Romit Majumder [a,b], Aindrila Chattopadhyay [a*], Debasish Bandyopadhyay [b**]
[a] Department of Physiology, Vidyasagar College, 39, Sankar Ghosh Lane, Kolkata, 700006, India [b] Oxidative Stress and Free Radical Biology Laboratory, Department of Physiology, University of Calcutta, 92, APC Road, Kolkata, 700009, India
e-mail: debasish63@gmail.com

Abstract:

Arsenic, the 20th most common natural element of earth's crust, has been raised as a metalloid as well as non essential heavy metal with potential toxicity. Previous mechanistic studies have documented arsenic as a generator of free radicals that play a fundamental role to induce oxidative stress mediated toxicity. Adverse dermal, gastrointestinal, hepatic, renal, cardiovascular, neurological effects due to arsenic subjection have been well accepted. But very scarce information is available as regards haematological aspects, although arsenic comes in direct contact with the blood through absorption of water or food stuffs containing arsenic. Erythrocytes, the unique cell lacking nucleus and other subcellular metabolic structures, accounts for almost 45% of total blood volume, are particularly vulnerable to oxidative damage due to their high oxygen exposure and hemoglobin content. Literature studies have well documented the pineal hormone melatonin as a potent direct free radical scavenger having potential antioxidant effects. Pharmacological studies indicate that melatonin is well-tolerated in humans without significant side effects and is present in a variety of easily accessible food sources. In this context, it is highly demanding to determine whether arsenic exposure alters the erythrocyte structure and functionalities due to oxidative stress mediated toxicity and whether melatonin exhibits any potential to ameliorate the alterations of RBC, if any, toward normal level and if such, then to elucidate the underlying mechanism behind it to protect arsenic induced oxidative stress which may be of future therapeutic importance.

Keywords: Oxidative stress, Arsenic, Erythrocyte, Melatonin, Antioxidant.

OP-26

Dopamine Sensing with Laser Tweezers Raman Spectroscopy

Hirak Chatterjee, Samiran Garain, Jinbo Bai and Raul A. Rica Alarcon*
Department of Applied Physics, University of Granada, Granada-18071, Spain
e-mail: hirak@ugr.es

Abstract:

Raman Spectroscopy is an important tool for label free, selective and sensitive detection of biomolecules in very small scale [1]. Laser tweezers enables the nanoparticles to push against the wall of a microfluidic chamber to form strong SERS active clusters of nanoparticles. Obtaining Raman signals by trapping nanoparticles and controlling their activity through spatial assignment is known as Laser Tweezers Raman Spectroscopy (LTRS) [2]. A periodic array of such clusters can be designed by generating bubbles precisely focusing the laser on the glass substrate, known as bubble pen lithography (BPL) [3]. But, strong photoluminescence from the glass surface becomes much more prominent which debarred to obtain the Raman signal from a probe. This can be minimized by enhancing the plasmonic interaction between the gold nanoparticle and the substrate containing graphene oxide (GO) giving rise to a more intense SERS signal. In this context, we develop a new SERS substrate by electrospinning a polymer GO composite on glass/ quartz. We use this polymer surface to grow gold clusters with BPL. Now shining on the individual clusters with the Raman laser, we have an exceptional increase in the SERS signal, leading to greater sensitivity. Dopamine has been used as a model analyte in the present work and a range of SERS signals based on laser power and dopamine concentration has been obtained. In essence, the work demonstrates an elegant combination of BPL with LTRS to develop a sensitive technique to detect biomolecules in a very subtle amount.

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OP-27

N-Heterocyclic Carbene Mediated Synthesis of Phthalidyl Sulfonohydrazones and Isoquinolines

Tanmoy Ghosh and Dilip K. Maiti*
Department of Chemistry, University of Calcutta, Kolkata 700009, India.
Email:dkmchem@caluniv.ac.in

Abstract

Reactivity of *N*-heterocyclic carbene is one of the most powerful tools in organocatalysis, and found numerous applications. *N*-heterocyclic carbene catalysis reaction protocol is disclosed for the synthesis of phthalidyl sulfonohydrazones. A broad range of *N*-tosyl hydrazones react effectively with phthalaldehyde derivatives under open-air conditions, enabling the formation of a new C−N bond via an oxidative path.

We were curious to know about the effect of NHC on the *N*-tosyl aldimine and phthaldehyde. We anticipated that *N*-sulfonylimines intermediate generated may undergo intramolecular aldol reaction to afford [4 + 2] annulation product. We explore the feasibility of such an idea for the synthesis of 3-substituted isoquinoline derivatives by using aldimines.

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Poster Presentation:

P-001

Cascade [4+1] Annulation Through Activation of C(sp^2)-H Bond Enabling Benzothiadiazinoisoindolcarboxylate, Benzothiadiazinoisoindole and Benzothiadiazinoisoindolepyrrolidinedione As Hybrid Spiro-Heterocyclic Frameworks

Anindita Sarkar*, Rahul Dev Mandal, Nirnita Chakraborty, Asish R. Das*
[a] Department of Chemistry, University of Calcutta, Kolkata
* *ardas66@rediffmail.com, ardchem@caluniv.ac.in*

Abstract:

Two structurally distinct and biologically privileged succinimide and isoindole heteroarenes bearing benzothiadiazinedioxide motif centered hybrid conjugates are proficiently achieved through Rh(III)-catalyzed sequential C(sp^2)-H bond activation, ortho-alkenylation and finally cascade intramolecular cyclization. The significant feature of this developed protocol is that the resulting diversely decorated heterocycles contain quaternary carbon center and this has been coursed through atypical [4+1]-annulation ignoring prevalent [4+2]-cyclization pathway and interestingly, the applied coupling partners (*eg:* maleimide, maleate and styrene) to materialize the protocol functioned only as C1 synthon. Furthermore, the selective reduction strategy enables to modify the hybrid conjugate of succinimide and benzothiazine dioxide to benzothiazine dioxide based spiro-cyclic isoindolopyrrolidinedione skeleton following preferential reduction of one carbonyl group of imide functionality. Overall this methodology emerges as to be easily-handled, versatile, time-efficient and manifests relatively unfamiliar spiro-cyclization and good functional group tolerance so easy to grab a library of the entirely new variant of decorated hybrid spiro -heterocyclic scaffolds.

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P-002

Facile Access to Luminescent Vinylene-linked Polymeric Materials for Nitro-Aromatics Detection and Iodine Capture

Arindam Nandy, Manab Chakravarty*
Department of Chemistry BITS Pilani Hyderabad Campus, Jahahar Nagar, Shameerpet, Hyderabad-500078 Telengana

(India)

Abstract:

Luminescent C-C π-conjugated microporous polymers (CMPs) are one of the important classes of porous stable organic materials, possessing a fully C-C π-conjugated skeleton and high surface area.[1] A few methods i.e Wittig and Horner-Wadsworth-Emmons (HWE) reactions, metal catalyzed C-C coupling reactions are most promising to generate such conjugated polymers. Compared with pioneering Wittig reactions, HWE reactions are found to be much more superior in reactivity and operational issues to achieve numerous π-Cs in a cost-effective strategy.[2] Moreover, it is a metal-free efficient approach to access C=C-linked polymeric frameworks by reacting to phosphonate with an aldehyde. Herein, we introduce developing metal- and aldehyde-free clean synthetic approaches to access π-conjugated polymers *via* single-pot or crossed oxidative dephosphorylation reactions of various bis/trisphosphonates. Various linear and cyclic (2D) polymers are availed directly from phosphonates in the presence of base/molecular oxygen without using any aldehydes. Initially, we focused on synthesizing reported polymers using this approach for comparison and extended this route to produce C_3-symmetric and linear polymers. The experimentally determined surface area 575.44 m^{2}g^{-1} of the materials synthesized in this strategy has appeared to be better than the previously reported one. Fully π-conjugated core makes them fluorescent, and this property is employed to detect various NACs such as picric acid in nM range, through fluorescence quenching. Further, developing efficient adsorbent materials for iodine scavenging is essential to mitigate the threat of radioactive iodine causing adverse effects on human health and the environment.[3] Large surface area and heteroatom rich polymers showed potential for iodine capture through distinct color change.

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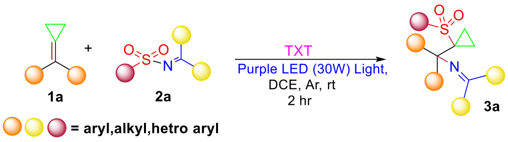
P-003

Photoinduced difunctionalization of alkylidenecyclopropanes (ACPs) with N-Sulfonyl Ketimines: Access to β-Amino Sulfone Derivatives

Darshana Patil and Utpal Das*
Division of Organic Chemistry, CSIR-National Chemical Laboratory, Pune 411008, India.
*Academy of scientific and Innovative Research (AcSIR), Ghaziabad 201002, India

Abstract:

The photoinduced β-amino sulfonation of the C=C double bond in alkylidenecyclopropanes was achieved in the presence of a bifunctional radical source N-sulfonyl ketimines. This process utilizes a photosensitized EnT (Excited-State Electron Transfer) strategy to generate both sulfonyl and N-centered radicals, which added to the C=C double bond of alkylidenecyclopropanes without causing ring opening, ensuring atom efficiency and high regioselectivity.



P-004

Palladium(II) Triazolylidene/Phosphine Complex as an Efficient Catalyst for Suzuki–Miyaura Coupling Reactions in Water

Debarati Mondal and Ramananda Maiti*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: rmchem@caluniv.ac.in

Abstract:

This work shows the synthesis of two mononuclear Pd^{II} mesoionic carbine (MIC) complexes with pyridine or PPh_3 as auxiliary ligands. An in-depth character analysis (NMR spectroscopy, mass spectrometry) have been executed for those complexes stated above. Another structural characterization has been implemented on the Pd(II)-PPh_3 complex by single crystal XRD measurement. Both the aforementioned complexes have been utilized as pre-catalyst in Suzuki-Miyaura coupling reaction. Experimental findings unequivocally demonstrate the supremacy of the Pd(II)-PPh_3 complex over the Pd(II)-PEPPSI type complex in the specified catalysis.

P-005

Facile Green Synthesis of Nonisocyanate Poly (ester urethanes) from Recycled Plastic Waste for Tissue Regeneration

Krishanu Ghosal[1], **Debleena Ghosh**[2], Dr. Kishor Sarkar*[3]

Gene Therapy and Tissue Engineering Lab, Department of Polymer Science and Technology, University of Calcutta, 92, A.P.C. Road, Kolkata- 700009, India
e-mail: kspoly@caluniv.ac.in.

Abstract:

Significant progress has been made in synthesis and processing of Polyurethane, expanding their applications across various fields. But, in biomedical application, the utilization of isocyanates and the usage of toxic catalysts for PU synthesis impose a significant challenge. In this study, we present a novel approach where the preparation of a series of poly (ester urethanes) occurs via an isocyanate and catalyst-free melt polycondensation process. To synthesize the poly (ester urethanes), we have employed a combination of poly (ethylene terephthalate) (PET) waste-derived monomers and a diverse range of renewable resources, including oleic acid, ethylene carbonate, citric acid, sebacic acid, and mannitol. The synthesis of the poly (ester urethanes) was confirmed by FTIR spectroscopy and ^{1}H NMR spectroscopy, while the physicochemical properties of the poly (ester urethanes) were investigated using XRD, TGA, DSC, and UTM. The mechanical characteristics of the synthesized poly (ester urethanes) closely resemble those of various soft tissues found in the human body, such as articular cartilage, cervical spinal components, ligaments, aorta, and soft collagenous bone, indicating its promising potential for soft tissue engineering applications. Moreover, the synthesized poly(ester urethanes) exhibited excellent shape memory behavior, along with a good recovery response at ambient temperature. Furthermore, the synthesized poly (ester urethanes) demonstrated certain levels of antimicrobial activity, exceptional in vitro cytocompatibility, and cell proliferation against mouse fibroblast cells (NIH/3T3) as confirmed by Alamar blue and live/dead assays suggesting its potential soft tissue engineering applications.
conditions.

P-006

Through-Space Charge Transfer in Aliphatic Dual-State Emissive Conducting Polymers and Selective Opto-Electronic Response Toward Ca^{2+} and Cu(II)

Deepak Chowdhury,[a] Shrestha Roy,[a,b] MD Hussain Sanfui,[a] Saikat Sarkar,[a,b] Pijush Kanti Chattopadhyay,[c] Dilip K. Maiti,[b] and Nayan Ranjan Singha[a,*]
[a,c]Government College of Engineering and Leather Technology (Post-Graduate), Department of Polymer Science and Technology and Department of Leather Technology, Maulana Abul Kalam Azad University of Technology, Salt Lake,
[b]Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata-700009, West Bengal, India
e-mail: nrsingha@gcelt.gov.in/ drs.nrs@gmail.com

Abstract:

Currently, conducting polymeric materials possessing opto-electronic properties in solid-state and solution have an immensely uprising demand in technological advancement of opto-electronic devices.[1,2] However, the design and synthesis of such macromolecular architectures is indeed critical. This work presents the strategic development of natural-synthetic hybrid dual-state emitting conducting polymers (HDECPs/ HDECP1–HDECP8) involving polymerization of synthetic prop-2-enamide, 2-acrylamido-2-methylpropane-1-sulfonic acid, cis-butenedioic acid, and in-situ anchored 2-(3-acrylamidopropanamido)-2-methylpropane-1-sulfonic acid monomers alongside grafting of natural biopolymer gum tragacanth. Among as-synthesized aliphatic HDECPs, spectroscopic data identifies HDECP7 as the most stable supramolecular assembly for exhibiting excellent opto-electronic properties.[3] Computational measurements of the as-optimized HDECP7 including structural alterations and percentage orbital contributions of monomers affirm –C(=O)OH, –C(=O)NH–, –OH, and $–SO_3H$ as the atypical heteroatomic subluminophores.[3,4] The UV-vis spectra, excitation wavelength-/ concentration-/ solvent-polarity-dependent emission, aggregation-induced enhanced emission, solid-state emission, and time-correlated single photon count (TCSPC) studies substantiate the occurrence of aggregation-assisted intramolecular through-space charge transfer (ITSCT) in excited state of HDECP7. The theoretical investigations further identify the charge donor-acceptor system in HDECP7. Additionally, the selective opto-electronic response of HDECP7 toward Ca^{2+}/ Cu(II) at different wavelengths are explored using absorption spectra, TCSPC analyses, dynamic light scattering study, and computational investigations.[1–4] Chelation-enhanced emission and inhibition of ITSCT are found to be responsible for the selective turn-on and turn-off detections of Ca^{2+} and Cu(II), respectively. Cyclic voltammetry measurements further reveal reduction of Cu(II) to Cu(I) in presence of redox-active –C(=O)OH/ –C(=O)NH– functionality in HDECP7. The conductivities of HDECP7, Ca^{2+}-HDECP7, and Cu(II)-HDECP7 in both solid-state and solution are validated by I-V and impedance measurements. The considerably high sensitivity of these natural-synthetic hybrid polymers is undeniably supportive toward strategic designing of technologically advanced optoelectronic gadgets and smart sensors in future.

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P-007

Revealing Dual-State ESIPT/ Conductivities, Redox Characteristics, and Opto-Electronic Interactions Toward Hg(II)/ Cr(III) of Non-Aromatic Dual-State Emissive Polymers

MD Hussain Sanfui,[a] Nadira Hassan,[a] Preetam Nandy,[a,b] Pijish Kanti Chattopadhyay,[c] Dilip K. Maiti,[b] and Nayan Ranjan Singha,[a,*]
[a,c]Government College of Engineering and Leather Technology (Post-Graduate), Department of Polymer Science and Technology and Department of Leather Technology, Maulana Abul Kalam Azad University of Technology
[b]Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata-700009, West Bengal, India
e-mail: nrsingha@gcelt.gov.in/ drs.nrs@gmail.com

Abstract:

At present, excited-state intramolecular proton transfer (ESIPT)-associated dual-state emissive redox-active dual-state conducting polymer is employed in sensing, imaging, opto-electronic devices, memory devices, photo-stabilizers, and solid-state laser devices. However, constructing an ESIPT-associated dual-state emissive dual-state conductive aliphatic redox polymer is one of the challenging tasks and is rarely documented. Herein, non-aromatic dual-state emissive conducting polymers (NDECPs) are synthesized polymerizing 2-acrylamido-2-methylpropane-1-sulfonic acid (AMPS), methacrylic acid (MAA), and in situ-anchored 2-methyl-3-(*N*-(2-methyl-1-sulfopropan-2-yl)acrylamido)propanoic acid (MSAMPA) monomers. Nuclear magnetic resonance (NMR) and Fourier transform infrared (FTIR) spectroscopies, fluorescent enhancements, and computational investigations reveal the most intriguing photophysical features in NDECP3 among all as-synthesized NDECPs (NDECP1–NDECP7). In NDECP3, –CONH–, –CON<, $–SO_3H$ and –COOH subluminophores are identified theoretically and experimentally.[1–3] Dual-state ESIPT-associated emission/ conductivity and redox properties of NDECP3 are substantiated by solid/ solution state ultraviolet-visible (UV-vis) spectroscopy, dual-state excitation dependent emissions (EDEs), time-correlated single photon counting (TCSPC) studies, solvent polarity effects, concentration-dependent emissions, dynamic light scattering (DLS) studies, field emission scanning electron microscopy (FESEM) images, cyclic voltammetry (CV) measurements, electrochemical impedance spectroscopy (EIS), current-voltage (*I-V*) measurements, and computational calculations. [4,5] Additionally, utilizing UV-vis/ TCSPC spectra, CV/ DLS/ EIS/ I-V measurements, and computational analyses, selective opto-electronic responses of NDECP3 toward Hg(II) and Cr(III) at 437 and 574 nm are investigated, respectively. Importantly, preferential interaction of Hg(II)/ Cr(III) with NDECP3 (amide)/ NDECP3 (imidol) and oxidation/ reduction of Hg(II)/ Cr(III) to Hg(I)/ Cr(VI) are further explored by NMR-titration, FTIR and XPS analyses, TCSPC/ CV measurement, alongside theoretical calculations.[1–5] The proton/ electrical conductivities of NDECP3, i.e., 15.27×10^{-5} S cm^{-1} (solid-state) and 6.16×10^{-5} S cm^{-1} (solution) in NDECP3 are confirmed by EIS/ I-V measurements.[4] Further, Hg(II/ I)-NDECP3 and Cr(III/ VI)-NDECP3 exhibit substantial proton/ electrical conductivity of 19.60×10^{-5} S cm^{-1} (solid-state)/ 25.52×10^{-5} S cm^{-1} (solution) and 26.69×10^{-5} S cm^{-1} (solid-state)/ 27.60×10^{-5} S cm^{-1} (solution), respectively. Therefore, strategic development of NDECP3 with integrated dual-state ESIPT-conductivity, reduction-/ oxidation-capacity, and opto-electronic responses is reported for the first time and is anticipated to be a viable substitute in the production of cutting-edge smart devices.

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P-008

Synthesis of Luminescent Aliphatic Polymers for amide-imidol tautomerism assisted Proton-Conductivity, ESIPT, and Oxidation-Reduction/ Sensing of Metal Ions

Nadira Hassan,[a] MD Hussain Sanfui,[a] Saikat Sarkar,[a,b] Pijush Kanti Chattopadhyay,[c] Dilip K. Maiti,[b] and Nayan Ranjan Singha[a,*]
[a,c]Government College of Engineering and Leather Technology (Post-Graduate), Department of Polymer Science and Technology, Maulana Abul Kalam Azad University of Technology, Salt Lake, Kolkata 700106, West Bengal, India
[b]Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata-700009, West Bengal, India
e-mail: nrsingha@gcelt.gov.in/ drs.nrs@gmail.com

Abstract:

Nowadays, design/ development of a dual emissive aliphatic conductive polymer coupled with excited state intramolecular proton transfer (ESIPT) is one of the most difficult challenges.[1] Herein, five aliphatic intrinsically light emissive conducting polymers (**LECP**s) are synthesized using different mole ratios of *N*-(propan-2-yl)prop-2-enamide (PPE), methyl-2-methylpropenoate (MMP), and 2-methylprop-2-enoic acid (MPEA) monomers alongside in situ-anchored 3-(*N*-(propan-2-yl)prop-2-enamido)-2-methylpropanoic acid (MMPA). The most promising properties in **LECP3** among as-synthesised **LECP**s are validated by luminescence enhancements, computational studies, alongside NMR and FTIR spectroscopies.[2,3] In **LECP3**, –C(=O)NH–, −C(=O)N<, –C(=O)OCH$_3$, and –C(=O)OH subluminophores are recognized by computational calculations and experimental analyses. Redox properties, aggregation-enhanced emissions (AEEs), solid state emissions, ESIPT, and conducting properties in **LECP3** are facilitated by these subluminophores.[1–4] The dual emission related with ESIPT/ AEEs of **LECP3** are explained by solvent polarity effects, TCSPC investigation, concentration-dependent emissions, DLS measurements, FESEM images, and computational calculations.[4] The higher Stokes shift at λ_{em2} than that at λ_{em1} further supports photo-tautomerism. The cyclic voltammetry (CV) measurements of **LECP3** indicate collective redox efficacy of –C(=O)NH–/ −C(=O)N<, –C(=O)OH,– –C(=N)OH, and C(–O$^-$)=NH$^+$–/ –C(–O$^-$)=N$^+$ functionalities. In **LECP3**, dual-emission phenomenon related with ESIPT enables selective detection of Cr(III)/ Cu(II) at λ_{em1}/ λ_{em2} with the limit of detection in ppb range (below WHO recommended limit). The anodic and cathodic responses in CV linked to Cr(III/VI) and Cu(II/I) redox couples, respectively, validate oxidation and reduction capabilities of **LECP3.**[4,5] Using I-V measurements and electrochemical impedance spectroscopy, proton conductivity of **LECP3** is investigated. Theoretical calculations, FTIR and XPS analysis, TCSPC/ electrochemical/ DLS measurement, and NMR-titration provide additional evidence toward preferential interaction of Cr(III)/ Cu(II) with **LECP3** (*amide*)/ **LECP3** (*imidol*) and oxidation/ reduction of Cr(III)/ Cu(II) to Cr(VI)/ Cu(I).

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P-009

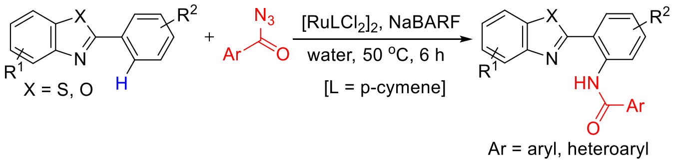
Late-stage Functionalization of Bioactive Scaffolds: “On Water” Ruthenium(II) Catalysed Direct Aryl C(sp^2)–H Amidation under Silver-free Condition

Nirjhar Saha[a], Bhavin V. Pipaliya,[b] and Asit K. Chakraborti*[a,b]

[a] School of Chemical Sciences, Indian Association for the Cultivation of Science (IACS), Jadavpur, Kolkata, West Bengal 700 032, India;
[b] Department of Medicinal Chemistry, National Institute of Pharmaceutical Education & Research (NIPER), Sector 67, S. A. S. Nagar, Punjab 160 062, India.

Abstract:

The 2-substitutedbenzo[*d*]-thiazole/oxazole scaffolds have been recognized as novel pharmacophoric features for diverse pharmacological (e.g. anti-TB and anti-inflammatory actions.[1-5] Thus, late-stage functionalization of these heterocyclic scaffolds provide opportunity to identify versatile chemotypes as new therapeutic leads. In this work, Ru(II)-catalyzed “On Water” direct aryl C(sp^2)–H amidation of 2-arylbenzo[*d*]-thiazole/oxazole with acyl azide is reported under silver-free condition. Deuterium scrambling experiments suggested reversible C–H activation catalyzed by active cationic ruthenium species. Water plays critical roles (i) during the formation of the active cationic Ru-species, (ii) as proton scavenger during ligand-assisted C–H activation through hydrogen bond formation as evidenced by solvent kinetic isotope effect, and (iii) in the final protodissociation step. The “On water” aryl C-H amidation protocol showed wide substrate scope with respect to the 2-arylbenzo[*d*]-thiazole/oxazole scaffold as well as the aryl moiety of the aryl azide. While the applicability of the Ru(II)-catalysed “on water” C-H amidation protocol to 2-arylbenzo[*d*]-thiazole and 2-arylbenzo[*d*]-oxazole demonstrates its scope with respect to the directing group the effectiveness for sulfonamidation and phosphoramidation further broaden the synthetic scope. As aromatic amines are ubiquitous structural component of drugs, pharmaceuticals and agrochemicals and amide group is present in 33% of the top 200 best-selling drugs in 2019 the amidation products of the bioactive 2-arylbenzo[*d*]-thiazole/oxazole represent diverse new molecular entities for further exploration of therapeutic applications.



Salient Features:
- Bio-relevant heterocycles as DG
- Lower reaction temp
- Shorter reaction time
- Cheaper Ru-catalyst
- Amidation
- Phosphoramidation
- Sulfonamidation
- 32 examples

Scheme 1. ‘On Water” Ru-catalysed C−H amidation directed by bioactive heterocycles.

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P-010

A Phenanthrenequinone-Based Ratiometric Fluorescent Probe for Rapid Detection of Peroxynitrite with Imaging in Osteoblast Precursor Cells

Pintu Ghosh, Anirban Karak, Ajit Kumar Mahapatra*
Indian Institute of Engineering Science and Technology, Shibpur
pintughosh10041997@gmail.com

Abstract:

In the current situation, peroxynitrite (ONOO–) is drawing the increasing attention of researchers for its pivotal role in diverse pathological and physiological processes on grounds of robust oxidation and nitrification. Herein, we have successfully designed and synthesized a phenanthrenequinone benzyl borate-based chemosensor for fast and selective detection of ONOO–. The probe PTDP itself had an orange fluorescence, which was changed to strong blue fluorescence upon the addition of ONOO–, indicating the ratiometric response of the probe. This is so because of the cleavage of the benzyl boronate-protecting group of PTDP upon the addition of ONOO– with simultaneous releasing of pyridinyl-based chemosensor PPI. The PTDP showed outstanding performance in the various photophysical studies such as good selectivity, excellent sensitivity with a very low detection limit of 2.74 nM, and a very fast response time (<15 s). Furthermore, for practical applicability, it was successfully applied in the ratiometric detection of ONOO– in osteoblast precursor cells.

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P-011

Cyclodextrin Based Sensors For The Detection Of Biomolecules

Dr. Rima Das
Assistant Professor, Department of Chemistry, Chandidas Mahavidyalaya, Khujutipara, Birbhum, WB.
chem.rima@gmail.com

Abstract:

Biomolecules are organic molecules produced by living organisms that are essential for various biological processes. They are the building blocks of life and play critical roles in structure, function, and regulation within cells and tissues. Cyclodextrins (CDs) are cyclic oligosaccharides composed of glucose subunits linked by α-1,4-glycosidic bonds. Their unique structure, consisting of a hydrophilic outer surface and a hydrophobic inner cavity, allows them to form host-guest complexes with various biomolecules. Cyclodextrin-based sensors represent a versatile and promising tool for detecting biomolecules. Their unique properties, coupled with advances in material science and nanotechnology, pave the way for developing highly sensitive and selective detection systems with broad applications in biotechnology and diagnostics. Cyclodextrin-based sensors employ several mechanisms to detect biomolecules, including Fluorescence technique, Electrochemical Detection method, Colorimetric and Chromogenic Sensing, Surface Plasmon Resonance (SPR) technique. This paper provides an update for detection of several biomolecules like protein, DNA, RNA, Enzyme etc. using CD based sensors.

Key words: Biomolecules, Cyclodextrin, Sensor**,** Oligosaccharide, Nanotechnology

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P-012

A luminescent columnar liquid crystal with high electrical conductivity in solution-processable nanoelectronics

Ritobrata De,[a] Madhusudan Maity,[a] Alvin Joseph,[b] Santosh Prasad Gupta,[c] Yogendra Nailwal,[a] Manoj A. G. Namboothiry[b]* and Santanu Kumar Pal[a]*
[a] Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER) Mohali, Sector-81, Sahibzada Ajit Singh Nagar, Knowledge City, Punjab 140306, India; [b] School of Physics, Indian Institute of Science Education and Research (IISER) Thiruvananthapuram, 695 551 Kerala, India; [c] Department of Physics, Patna University, Patna, Bihar 800005, India.
mp18024@iisermohali.ac.in

Abstract:

Recent advancements in the field of organic semiconductors emphasize a challenge of achieving the perfect balance between effective charge-carrier transport and solution-processability.[1] In this context, discotic liquid crystals (DLCs) are a class of self-assembling materials harmonizing supramolecular order and dynamics in a system that can potentially address the challenge.[2,3] In this work, we envision a minimalistic design strategy for a cyanovinylene-integrated pyrene-based DLC (**PY-DLC**) to exhibit a room-temperature columnar hexagonal mesophase and a narrow band gap for efficient semiconducting behavior. Even at low values of applied voltage, **PY-DLC** exhibited superior charge extraction ability from the contact electrodes, achieving an electrical conductivity of 3.22×10^{-4} S/m, the highest reported value for any undoped DLC film in a vertical charge transport device. Its hole mobility values were comparable to the best organic hole transport layers (10^{-3} cm^2/Vs). In analogy with device performances, photophysical studies were correlated with carrier transport in the excited state induced by charge injection, substantially corroborated by theoretical studies on the molecular geometry, frontier orbitals and reorganization energies.[4]

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P-013

Skeletal Reorganization Emanated via the Course of Heterocyclic N^1-N^2 Bond Cleavage: Electrosynthetic Approach

Saiful Islam[1], Dwaipayan Das*[1], Rahul Dev Mandal[1], Samiran Dhara[1] and Asish R Das*[1]
1Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata-700009, W B, India.
ardchem@caluniv.ac.in, ardas66@rediffmail.com.

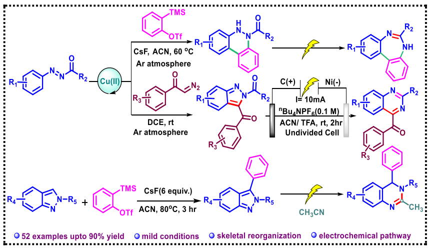

Figure 1: Skeletal Reorganization Emanated via the Course of Heterocyclic N^1-N^2 Bond Cleavage

Abstract:

A unified method towards the synthesis of functionalized diazepines and quinazolines through reorganization of the molecular skeleton has been devised. The process is indulged by electrical energy via a domino N^1–N^2 bond cleavage followed by concomitant ring closing, initiating from cinnolines and indazoles as designed precursors. Additionally, an intermolecular ring homologation has also been established to synthesize densely functionalized dihydroquinazolines from 2,3-diaryl-indazoles and acetonitrile involving the same electrochemical strategy.

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P-014

Beyond the Code: Harnessing Long Non-Coding RNAs in Oncology

Dr. Sayantan Banerjee, Assistant Professor,
Department of Zoology, Chandidas Mahavidyalya, Birbhum,West Bengal-731215
sayantanbanerjee2010@gmail.com

Abstract

Long non-coding RNAs, have emerged as pivotal entities in cancer biology. Long non-coding RNAs (lncRNAs) display aberrant expression across various cancer types, facilitating tumour development, progression, metastasis, and resistance to therapy. In contrast to protein-coding genes, lncRNAs exhibit tissue-specific expression patterns, rendering them potential therapeutic targets with little off-target consequences. This abstract examines the transformative potential of targeting lncRNAs in oncological therapy. We examine significant lncRNAs associated with oncogenesis, including HOTAIR, MALAT1, and PVT1, which function as oncogenic drivers or tumour suppressors. Therapeutic approaches, including as RNA interference (RNAi), antisense oligonucleotides (ASOs), and CRISPR-Cas9 gene editing, are emphasised as methods to regulate lncRNA activity. The paper also addresses the application of small molecules and nanoparticles for the targeted delivery of lncRNA, highlighting progress in addressing stability and specificity problems. Although lncRNAs possess significant potential, addressing them presents obstacles. Off-target effects, limitations to RNA transport, and a limited comprehension of their molecular functions in cancer persist as substantial obstacles. The emergence of high-throughput sequencing and single-cell RNA technologies is enhancing our capacity to delineate lncRNA-cancer relationships, facilitating the advancement of precision therapy. Targeting lncRNAs allows us to utilise a new dimension of gene control, providing potential for the advancement of novel and personalised cancer treatments. This paradigm change highlights the unexploited potential of lncRNAs as biomarkers and therapeutic agents in the fight against cancer.

P-015

Ni(0)-Catalyzed Efficient, Regioselective Synthesis of Dibenzo[*b*,*e*]oxepines and Dibenzo[*c*,*f*][1,2]oxathiepine 6,6-Dioxides: Mechanistic Study by DFT Calculation and Docking Interactions

Uma Sankar Mandal, **Sk Shamim Ahamed**, Rabindranath Lo*, Debashree Manna* and Tapas Ghosh*
Department of Chemistry, Jadavpur University, Kolkata-700032
tapasg.chemistry@jadavpuruniversity.in, shamimahamed652@gmail.com

Abstract:

An efficient nickel-catalyzed strategy has been developed for the synthesis of medium-ring heterocycles, including dibenzo[*b*,*e*]azepine, dibenzo[*c*,*f*][1,2]thiazepine, dibenzo[*b*,*e*]-oxepine and dibenzo[*c*,*f*][1,2]oxathiepine derivatives.[1-4] This scalable and ligand-free methodology employs regioselective reductive-Heck reactions, optimized through the regulation of reducing agents and solvent systems. The approach tolerates a wide range substrate scope such as electron donating (-OCH_3, -CH_3,) and electron withdrawing (-Cl) aromatic alkynes as well as aliphatic alkynes and proceeds under mild conditions to furnish the desired products in good to excellent yields with high regio and stereoselectivity.

The utility of this protocol is exemplified by the synthesis of active pharmaceutical ingredients doxepin and nordoxepin. Mechanistic insights were gained through density functional theory (DFT) studies,[5] validating the proposed reaction mechanism. Additionally, molecular docking studies of selected synthesized compounds demonstrate promising biological interactions and highlight the potential applications of this methodology in medicinal chemistry.

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P-016

Synthesis of Dual-FRET Conductive Polymer-, Anionic Polymer-, and Polymer-Inorganic-Nanohybrid for S^{2-}/ Cd(II) Sensing and Electrocatalytic Reduction of Nitrobenzene

Shrestha Roy,[a,b] Deepak Chowdhury,[a] MD Hussain Sanfui,[a] Preetam Nandy,[a,b] Dilip K. Maiti,[a,*] and Nayan Ranjan Singha,[b,*]
[a]Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata-700009, West Bengal, India
[b]Government College of Engineering and Leather Technology (Post-Graduate), Department of Polymer Science and Technology, Maulana Abul Kalam Azad University of Technology, Salt Lake, Kolkata 700106, West Bengal, India
nrsingha@gcelt.gov.in/ drs.nrs@gmail.com

Abstract:
The development of opto-electrochemically-active smart fluorescent materials is indeed imperative to meet the utmost technological demands of the current century. Among these materials, hybrid fluorescent polymers possessing low band-gap, large electroactive surface, redox ability, electron-/ energy-transfer efficacy, and electrical conductivity are effective as chromofluorogenic sensors and electrocatalysts.[1–4] Here, protonated amino graphene oxide (AGO) nanoparticle and thiolated collagen are strategically incorporated into purely-aliphatic *poly-N*,*N*-dimethylacrylamide (*poly*-DMAM) to explore cumulative effect of DMAM, AGO, and thiolated collagen on opto-electronic properties of hybrid polymer. Importantly, electron/ energy donation, π-π*/ n-π* transitions, high conductivity, and positive charge density in protonated AGO; redox activity of –CON functionalities, hydrophilic-hydrophobic balance, and aggregation tendency in energy acceptor DMAM; alongside electrostatic/ hydrogen bonding/ salt bridge interaction, conducting units, and redox abilities of cysteine/ cystine in thiolated collagen impart fluorescence resonance energy transfer (FRET)-associated dual-emission, excellent anion (S^{2-})/ soft metal ion (Cd(II)) binding efficacy, and appreciable electroreduction ability.[1,3] In this work, initially, a series of hybrid fluorescent conducting polymers (**HFCP**s) are fabricated incorporating different amounts of AGO into *poly*-DMAM. Among these, **HFCP3** is chosen as the optimum matrix by analyzing nuclear magnetic resonance/ Fourier transform infrared spectra and X-ray diffraction profiles of **HFCP**s. The photophysical and electrochemical properties of **HFCP3** are explored by dual-state absorption/ fluorescence spectroscopies and cyclic voltammetry, respectively.[2,4] Further, different amounts of thiolated collagen are intruded into **HFCP3** to fabricate a series of collagen-incorporated hybrid fluorescence conducting polymers (**CHFCP**s). Of **CHFCP**s, **CHFCP2** is found to be the optimum matrix with excellent photophysical properties, electronic transitions, and redox activities. Here, AGO→*poly*-DMAM→collagen sequential FRET is confirmed from dual-state absorption/ fluorescence spectroscopy, time-correlated single photon counting measurements, cyclic voltammetry, and impedance spectroscopy. The opto-electronic responses of **CHFCP2** are utilized to carry out sensing of S^{2-}/ Cd(II) in H_2O and organic media. Followed by sequential S^{2-} and Cd(II) sensing, **CHFCP2** is reutilized to fabricate anionic polymer nanohybrid **CHFCP2**–S^{2-} (**CHFCP2**(I)) and polymer-inorganic nanohybrid **CHFCP2**–S^{2-}–Cd(II) (**CHFCP2**(II)) to conduct electrochemical reduction of nitrobenzene in H_2O and organic media. The exploration of a new strategy in preparing double-FRET active **CHFCP2** as S^{2-}/ Cd(II) sensor and subsequent fabrications of **CHFCP2**(I)/ **CHFCP2**(II) electrocatalyst for electrochemical reduction of nitrobenzene is undoubtedly a challenging task and reported for the first time.

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P-017

Fluorometric and naked eye detection of cadmium ion by reducedSchiff base Zinc- based probe in potable water: Theoretical and experimental approach

Aditi Dhar, Debasis Das *
Department of Chemistry, University College of Science, University of Calcutta, 92, A. P. C. Road, Kolkata 700009, India

Abstract:
Alarmingly increasing population and industrial growth has immensely affected water bodies and potable water sources by elution of many heavy toxic metals mainly Cadmium. The rising threat has demanded easy and cost-effective detection so as to spread widely across the masses and eliminate the poisoning of water. With this aim, we have synthesized a zinc-based fluorescent probe (rBDZn) having reduced Schiff base backbone with N,O- donor atoms derived from 5-bromosalicaldehyde and 2,2- dimethylpropane-1,3-diamine, characterized by the aid of Single Crystal X-Ray diffraction method revealing a trimeric structure linearly bridged by azide ion. The complex has been found to exhibit a cyan blue fluorescence getting 'turned-off' in presence of cadmium ion selectively among many other cations in an aqueous solution along with a naked-eye visible colour change from pale yellow to colourless. Steady-state and time-resolved fluorescence titration study, absorption titration study were performed. Investigating the sensing pathway it is discovered that the detection of Cd 2+ is being associated with the formation of the cadmium complex rBDCd from the probe rBDZn though a probable mechanism. In support of the fact a single crystal of Cd-substituted complex have been isolated and verified with single crystal XRD and computational calculations. Proper justification of the selectivity of the probe towards Cadmium ion with a very low detection limit of 1.72 nM enables its genuine implications in pollution management.

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P-018

Design of Liquid Crystal Aqueous Interface for Detection of Calcium Ions Using Protein as Recognition Probe

Soma Sil,[1] Manisha Devi,[2] Ipsita Pani,[2] Tarang Gupta,[2] Santanu Kumar Pal[*]
[1]Research Scholar, Department of Chemical Sciences, IISER MOHALI, Sector 81, Punjab-140306, India
[2]Department of Chemical Sciences, IISER MOHALI, Sector 81, Punjab-140306
skpal@iisermohali.ac.in

Abstract:

The advancement of liquid crystal (LC)-based biosensing platform for understanding the interactions of adsorbed proteins with lipid-designed LC-aqueous interface has significant scientific interest due to its point-of-care diagnostic applications and fundamental biological research. The ordering transition of LCs at 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC)-decorated LC-aqueous interface was examined to observe the biosensing of a physiologically important Ca^{2+} signaling protein recombinant human calmodulin (CaM). Self-assembled POPC molecules promote homeotropic anchoring of LC at the LC-aqueous interface leading to dark optical appearances under crossed polarizers. Interestingly, the optical state of LC changed to planar (bright optical appearance) when CaM was in the proximity of lipid-adsorbed LC-aqueous interfaces indicating label-free CaM detection at those interfaces. It was further observed that POPC decorated LC-aqueous interface is specific for imaging of CaM protein among other amphiphiles (DLPC, CTAB, and SDS) decorated LC-aqueous interfaces tested. The sensitivity of POPC decorated LC-aqueous interface towards the detection of CaM was observed in the nanomolar regime (~150 nM). CaM is Ca^{2+} binding protein, hence, CaM-POPC decorated LC-aqueous interface was further utilized for the detection of Ca^{2+}. Interaction of CaM with Ca^{2+} increases the α-helical content of CaM that results in the reorganization of POPC molecules at the LC-aqueous interface and leads to the homeotropic orientation of LC with a dark appearance under crossed polarizer. In comparison to other spectroscopic/biological techniques, the LC-based system is easy to handle due to its simple label-free optical data, high sensitivity, cost-effectivity, and less sample requirement. [1,2]

Keywords: Calmodulin; LC; LC-aqueous interfaces; amphiphiles; POPC; Ca^{2+} sensor

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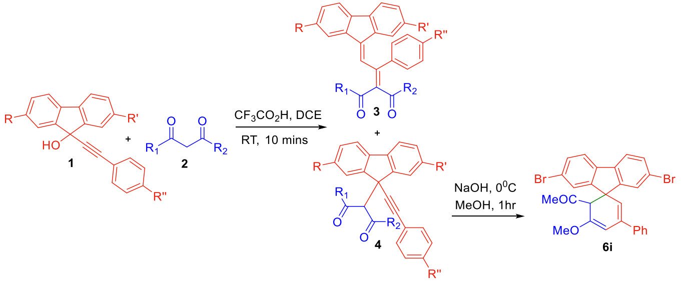
P-019

Bronsted acid-catalyzed reaction of 1,3 dicarbonyls with coplanar 9-(phenylethynyl)-9h-flouren-9-ols

Subhashini Aravamudhan, and Ponnusamy Shanmugam*
Organic and Bioorganic Chemistry Division, (CSIR)-Central Leather Research Institute, Adyar, Chennai-600020
shanmu196@rediffmail.com

Abstract:

The 2-substituted propargylic alcohols are extremely useful synthons in organic synthesis[i] and highly reactive with Lewis acid[ii]. Fluorene and its derivatives have significant applications in organic electro-luminescence materials, two-photon absorbing materials, photochromic materials, solar cells, medicinal chemistry, etc. We recently reported the reaction of fluorene-9-propargylic alcohols with N-methyl-7-azaindole to prepare blue emissive compounds via a highly stable propargylic cation[iii]. The functionality and interesting structural properties of 1,3-dicarbonyl compounds in organic chemistry are well illustrated by their utility in Claisen, Knoevenagel, and Michael addition reactions[iv]. Exploring the reactivity of fluorene propargylic alcohol in the presence of 1,3-dicarbonyls[v] Bronsted acid catalysts resulted in highly conjugated dienediones and propargyl-substituted 1,3 dicarbonyl derivatives. Based on the structure of the products, a plausible mechanism is proposed. Study details will be presented in the poster (Scheme 1).



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P-020

Total Synthesis of Lipopeptide Bacilotetrin C: Discovery of Potent Anticancer Congeners Promoting Autophagy

Subrata Mandi & Rajib Kumar Goswami*
School of Chemical Sciences, Indian Association for the Cultivation of Science
2A & B Raja S C Mullick Road, Kolkata 700032, India
ocrkg@iacs.res.in

Abstract:

A convergent strategy for the first total synthesis of lipopeptide bacilotertrin C has been developed. The key features of this synthesis include Crimmins acetate aldol, Steglich esterification, and macrolactamization. Twenty-nine variants of the natural product were prepared following a systematic structure-activity relationship study where some of the designed analogues showed promising cytotoxic activity against multiple human carcinoma cell lines. The most potent analog exhibited ~37-fold enhancement in cytotoxicity compared to bacilotertrin C in triple-negative breast cancer (MDA-MB-231) cell line at sub-micromolar dose. Further investigations revealed that some of the analogs induced autophagy in cancer cells to the point of their demise at much lower doses than the known autophagy-inducing peptides. The results demonstrated that the chemical synthesis of bacilotertrin C with suitable improvisation played an important role in the development of novel anticancer chemotherapeutics which would allow the future rational designing of novel autophagy inducers on this template

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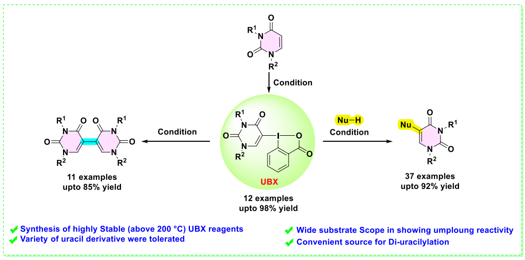
P-021

Discovery Of Novel Uracil-Containing Cyclic Hypervalent Iodine Reagent & Its Application

[1]**Sukanya Das*** and [1]Dr. Raj K. Nandi
[1]Department of Chemistry, Jadavpur University, Kolkata-700032
sukanyadas01997@gmail.com

Abstract:

A novel class of uracil-based cyclic hypervalent iodine reagents (UBX) has been developed, marking a significant breakthrough in organic synthesis. These reagents integrate uracil, a biologically significant nucleobase, into a stable cyclic structure, enabling exceptional tolerance for structural variations. With exceptional tolerance for structural diversity, UBX reagents open up exciting new avenues for synthetic strategies and reaction pathways that were previously difficult to achieve.



One of their most notable features is their remarkable stability, as they can endure temperatures exceeding 200 °C. A major advantage is their capacity to enable umpolung reactions, which reverse the inherent polarity of uracil derivatives. This ability opens the door to unique reactivity pathways that are typically challenging to accomplish through conventional methods. In addition to their reactivity, UBX reagents also provide an efficient approach for di-uracilylation, making the incorporation of two uracil units into target molecules straightforward and reliable. This dual-functionalization capability holds great promise for pharmaceutical and materials science applications, where uracil derivatives are crucial building blocks. This breakthrough positions UBX reagents as a key tool for innovation in fields ranging from medicinal chemistry to advanced materials development, offering unprecedented opportunities to explore and create novel uracil-based compounds.

P-023

Tailoring an ordered Nematic Liquid Crystal with FRET activity to observe electrical conductivity in solution processable nanofilms

Ritobrata De, **Sumonta Sarkar**‡, Ajay Jain‡ and Santanu Kumar Pal*,
Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER) Mohali, Sector-81, SAS Nagar, Knowledge City, Manauli 140306, India'
‡Equally contributed
mp23008@iisermohali.ac.in

Abstract:

Nowadays, solution processable organic semiconductors are in high demand. In optoelectronic devices, structurally more ordered charge transport systems must be embroidered concurrently with less rigidity to form a uniform film.[1] In this regard, the ultimate goal is to induce the fluid properties in the organic charge transport layer through nematic mesophases without hampering its electrical properties. Liquid crystals are effective in such cases, serving as an intermediate between isotropic liquid phase and crystalline solid phase.[2-4] Keeping this in mind, a discotic liquid crystal (DLC) dyad with luminescent property was engineered, which showed a columnar nematic phase at room temperature. Electronic interaction and energy transfer in the excited state was governed by the donor and acceptor units. This uniqueness of the ordered columnar nematic phase rendered solution-processable nanofilms without any defect. Under ambient conditions, this DLC dyad was suited for nanoscale device fabrication, and its undoped native state exhibited noticeable charge extraction property with an electrical conductivity of 10^{-6} Sm^{-1}. This is the first report in charge-transport study of FRET-enabled nematic mesophases.[5]

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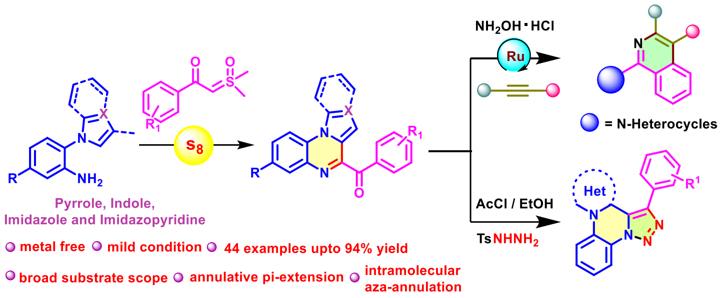
P-024

Pragmatic Access to Hybrid Quinoxaline Scaffold Mediated by Elemental Sulfur Enabling Actualization to π Extended and AzaAnnulated Heterocyclic Units

Swarnali Ghosh, Dwaipayan Das,* Rahul Dev Mandal, and Asish R. Das*
Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata-700009, W B, India.
E-mail: ardchem@caluniv.ac.in, ardas66@rediffmail.com

Abstract :

A metal-free approach for synthesizing hybrid quinoxaline derivatives from sulfoxonium ylide and a 1,5-bisnucleophilic N-heterocycle mediated by elemental sulfur is presented to illuminate the [5+1] cascade cyclization sequence. Largescale synthesis and postsynthetic functionalizations for the annulative π-extension and intramolecular aza-annulation reactions reveal the potential utility and actualize the fabricated approach.



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P-025

Pyrene-Based AIEE-Active Vertically Grown Luminescent Material for Selective and Sensitive Detection of TNT Vapor

Ajeet Singh[a], Ram Prasad Bhatta[a], Anindya Datta[b]*****, Inamur Rahaman Laskar[a]*****
[a] Department of Chemistry, BITS-Pilani, Pilani Campus, Rajasthan, 333031, INDIA
e-mail: ir_laskar@pilani.bits-pilani.ac.in
[b] Department of Chemistry, IIT Bombay, Mumbai, India
e-mail: anindya@chem.iitb.ac.in

Abstract :

Pyrene-based molecules often encounter the challenge of "aggregation-caused quenching" (ACQ) due to their rigid planar structures that promote π–π stacking interactions, limiting their applicability as solid-state luminescent materials. To address this issue, two novel compounds were strategically designed and synthesized: 2-(pyren-1-yl)-4,6-bis(4-vinylphenyl)-1,3,5-triazine (VinTr) and 4-chloro-N,N-diphenyl-6-(pyren-1-yl)-1,3,5-triazin-2-amine (PyTrDA), incorporating pyrene-triazine frameworks to induce "aggregation-induced enhanced emission" (AIEE) behavior. Computational investigations, using density functional theory (DFT) with B3LYP functional and LANL2DZ basis set, provided insights into the electronic structure and photoinduced electron transfer (PET) mechanism between PyTrDA and trinitrotoluene (TNT). These calculations revealed that the PET process arises from the efficient charge transfer between the probe (PyTrDA) and the analyte (TNT), validated further through transient absorption spectroscopy. Among the two compounds, PyTrDA demonstrated exceptional sensitivity and selectivity for TNT detection, with a detection limit of 216 pM in solution and ~7.0 ppb in the vapor phase. A notable morphological transformation from a planar sheet-type structure (observed in PyTr) to vertically grown nanorods (in PyTrDA) was identified, offering an increased surface area that facilitates TNT molecule diffusion. This nano structural enhancement was analyzed computationally, showing the role of morphology in optimizing host-guest interactions at the molecular level. This is the first study to explore the computational validation of nano structural morphology's role in enhancing TNT sensing using small organic molecules.

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P-026

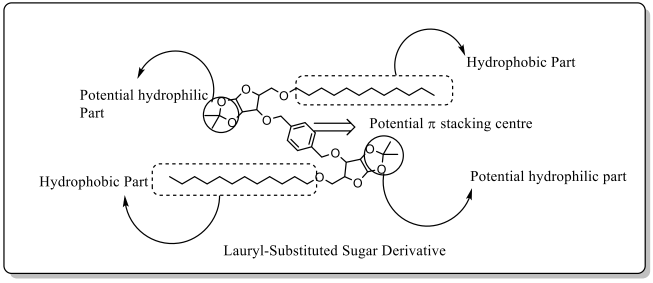
Sustainable Synthesis towards Lauryl-Substituted Sugar, and emerging potential gelator and metal ion sensors

Arpan Basu, Jhimli Sengupta*,
Department of Chemistry, West Bengal State University, Barasat, Kolkata-700126, India
E-mail: jhimli.sengupta@gmail.com

Abstract :

This study explores the synthesis of lauryl-substituted sugar derivative[1,2] using cost-effective D-glucose as the starting material. By incorporating a long-chain lauryl group and an aromatic ring into the sugar moiety, the resulting derivatives exhibit an amphiphilic structure, combining the hydrophilic nature of the sugar unit with the hydrophobic properties of the lauryl chain. These modifications enhance surfactant properties and provide potential applications as organogelators and metal-sensing molecules. The study highlights a sustainable and eco-friendly approach for developing sugar-based biodegradable alternatives to conventional surfactants, organogelators, and metal ion sensors.

Keywords: D-glucofuranose,ether-linked 1,2:5,6-O-isopropylidenefuranosides,other surface-active molecule,organogelators,and metal sensing molecule.



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P-027

Palladium/DBU-catalyzed aryl C–H activation towards rapid synthesis of carbazoles

Asifur Rahaman Mallick, Rejaul Karim, Aminur Khan, Safiul Alam*
Department of Chemistry, Aliah University, IIA/27, New Town, Kolkata 700160, India;
e-mail: safiul_ku@yahoo.co.in, asifur387475@gmail.com

Abstract:

The carbazole nucleus is one of the most important heterocyclic units found in both synthetic and naturally occurring alkaloids have antitumoral, antiproliferative, anticancer, anti-bacterial, anti-fungal, and anti-angiogenic activitie[1a]. Photophysical properties such as high hole-transporting efficiency and photoconductivity, offer their applications in optoelectronic materials such as in organic solar cells (OSCs), dye-sensitized solar cells (DSSCs) and organic light-emitting diodes (OLEDs) were shown by carbazole moiety[1b]. An efficient method is reported to prepare functionalized carbazoles in excellent yields under mild conditions through microwave-assisted Pd-catalyzed aryl C-H activation of 2-iodo-*N*-arylanilines. Use of DBU[1c] (1,8-diazabicyclo[5.4.0]undec-7-ene) as base in DMF is found advantageous[1d]. Microwave is found beneficial to shorten the reaction time, improve yield, and reduce the amount of base and solvent consumption. Moreover, it offers the access to 4-acetylcarbazole, which was not obtained under conventional heating condition. DBU act as a ligand as well as base, resulting in improved functional group tolerance and higher yields than those observed with inorganic or other nitrogen bases.

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P-028

Precise molecular design for a twisted pyrene-thiophene based mechanofluorochromic probe with large Stokes shift and feasibility study towards security ink and re-writable papers

Nancy[a], Ram Prasad Bhatta[a], and Inamur Rahaman Laskar[a]
[a] Department of Chemistry, Birla Institute of Technology and Science (BITS), Pilani Campus, Pilani, Rajasthan 333031, India.
E-mail: ir_laskar@pilani.bits-pilani.ac.in

Abstract :

The creation of MFC-active smart molecules by tuning functionality has received considerable attention owing to its versatile applicability. Pyrene-based twisted donor–acceptor (D–A) dyes (PySS and PySP) have been synthesized and characterized. Here, the pyrene is directly connected with thiophene, and this unit is further linked terminally to photoactive species (thiophene/pyridine) via a four-carbon unit conjugated spacer. These molecules show excellent solvatochromic properties, with a substantial shifting of the emission wavelength (PySS-147 nm and PySP- 130 nm). The lowest transition state contains a significant contribution from ICT characteristics, as evidenced by spectral analysis and computational calculations. Moreover, these are identified as 'aggregationinduced enhanced emission' (AIEE) active compounds and exhibit mechanofluorochromism (MFC). By grinding, PySS and PySP display MFC features with 50 nm and 54 nm red shifting, respectively. Interestingly, PySS shows a gradual emission change from green (510 nm) to orange emission (578 nm) by gradually changing the pressure with a hydraulic press (0 to 12.5 tons). The single crystal structure of both compounds was investigated to understand the structure-property relationship for MFC. The crystal packing shows that the twisted molecules (dihedral angle between pyrene and thiophene is 59.361 and 56.931 for PySS and PySP, respectively) are loosely bound with several weak interactions (C–H . . . π, C–π. . . H, H . . . H, C–H . . . O). Interestingly, it was observed that two molecules in a unit cell are arranged in an antiparallel fashion; these molecular pairs are linearly connected to another pair axially, forming a long one-dimensional chain-type arrangement. On applying pressure, these twisted molecular pairs may slowly planarize, leading the molecules to come closer, thus changing the molecular interaction and the emission properties. A feasibility study of the potentiality of using these compounds in data encryption–decryption and security ink has also been demonstrated.

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P-029

Interaction of Curcumin with Anti-Parallel DNA G-quadruplex Structures: A Spectroscopic and Molecular Docking Approach

Pabitra Mandal[a], Priyabrata Das[a], Sudipta Bhowmik[b,c,]*and Smritimoy Pramanik[a,]*
[a]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India
[b]Department of Biophysics Molecular Biology and Bioinformatics, University of Calcutta, 92, A. P. C. Road, Kolkata-700009, India
[c]Mahatma Gandhi Medical Advance Research Institute (MGMARI), Sri Balaji Vidyapeeth (Deemed to be University), Pondicherry 607402, India
e-mail: spchem@caluniv.ac.in

Abstract :

Guanine-rich DNA sequences are prevalent throughout the genome and they readily fold to form G-quadruplex structures both *in-vitro* and *in-vivo*. [1,2] Owing to their regulatory roles in important biological reactions, DNA G-quadruplexes are the prime target for the development of anti-cancer drug molecules. [2-4] In the present study, we have demonstrated the interaction of curcumin with anti-parallel chair and basket type DNA G-quadruplexes formed by thrombin binding aptamer (TBA) and human telomeric repeat (HTG) sequences, respectively. The results obtained from spectroscopic techniques emphasize that curcumin interacts with both the DNA G-quadruplexes through external binding mode and the estimated apparent binding constant value (K_b) was slightly higher for HTG than that estimated for TBA DNA G-quadruplex structure. UV and CD melting studies revealed that upon binding with curcumin, TBA and HTG DNA G-quadruplexes were slightly stabilized and destabilized, respectively. CD study revealed that upon binding with curcumin the global structure of both the DNA G-quadruplexes was unaltered, whereas the local structure of HTG DNA G-quadruplex was slightly altered. Molecular docking study revealed that curcumin is bound to the edge-wise loop of TBA and the diagonal loop of HTG, respectively. Thus, both the spectroscopic and molecular docking study emphasize that curcumin has differential interaction with anti-parallel DNA G-quadruplex structures depending on their loop orientation.

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P-030

$NaBH_4$-Induced Chemoselective Mechanochemical Neat Synthesis of Bio-Active Dihydrofuran/ε-Hydroxy-α,β- Unsaturated Esters and Synthetic Application to Isoindoles

Paritosh Barik,[a, b] Chandan Kumar Pal, Sudipta Chakraborty, Sk Abulkalam Azad, Prasanta Patra, Rathin Jana,* Mijanur Rahaman Molla,*[b] and Shubhankar Samanta*[a]
[b]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: mrmchem@caluniv.ac.in
[a]Department of Chemistry, Bidhannagar College, Salt Lake, sector – I, Kolkata 700064, INDIA
e-mail: chemshubha@gmail.com

Abstract :

The synthesis of small heterocycles under neat mechanochemical conditions[1] is of great interest in the field of drug design because most of the commercially available drugs[2] contain at least one heterocyclic unit. The sodium borohydride ($NaBH_4$) promoted reductive cyclization to fused dihydrofuran[3] under grinding technique is one of the compendium additions for the clean future.[4] The development of chemoselective reduction under silica-gel supported conditions represents significant progress in organic synthesis, offering a versatile and efficient method for selective reduction of specific functional groups within complex molecules. Synthesis of isoindole derivatives from the chemoselective reduce product via a sustainable[5] short synthetic pathway is another significant process of our newly developed protocol. Finally, antileishmanial[6] investigations of our synthesized compounds establish a soft bridge between biology and chemistry.

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P-031

Molecular Platform Technology for the Development of RT-PCR based Diagnosis of Viral Infections

Parveen Kumar Yadav, Priyanka Pandey, Ashish Arora, Niti Kumar, Atul Goel*
Medicinal and Process Chemistry Division, CSIR-Central Drug Research Institute, Sector-10, Jankipuram Extension, Lucknow, 226031, INDIA
e-mail: parveenky20@gmail.com

Abstract :

Global outbreaks of mosquito-transmitted arbovirus infections, such as dengue (DENV), (ZIKV) Zika virus and chikungunya (CHIKV) are threat for human life. Differentiating these infections is challenging due to non-specific symptoms and serology limitations. So far, the most accurate detecting technique for such viral infection in a patient sample is the real-time RT–PCR (reverse transcription–polymerase chain reaction) assay, which allows qualitative identification of specific viral infections.2 TaqMan probes have been used successfully to detect viral infection since disease's inception, 3,4 however, the cost of TaqMan probes and their availability is creating a bottleneck in patient testing at large scale because of dyes (FAM, VIC, ABY, JUN, Cal Fluor, Cy5) and quenchers (QSY, BHQ-1, BHQ-2, BBQ) are all imported. One of the essential applications of probes containing a fluorophore-quencher molecule pair is their use in nucleic acid amplification reactions, such as polymerase chain reactions (PCR), to detect the presence and amplification of any target nucleic acid sequences.

Under the “Self-Reliant India Campaign”, our research group is involved in the in-house designing of an efficient and reliable approach for developing dual-labeled oligonucleotide TaqMan-like probes to construct a new multiplex protocol for Arbovirus detection by utilizing the click chemistry to avoid traditional costly Phosphoramidite chemistry. We have also demonstrated that the synthesized novel quencher fulfills the unmet need for one universal quencher for multiplexing capabilities.5 We have done the in-house synthesis of well-known fluorophore dyes used in RT–PCR and a new class of substituted diazenylanilines as fluorescence quenchers. We described a rapid, high-quality, cost-effective TaqMan-based probe methodology that may be utilized to detect any target sequence. Thus, our research focuses on synthesizing and designing fluorescence quenching probes and their application in diagnostics. These details will be highlighted in the presentation.

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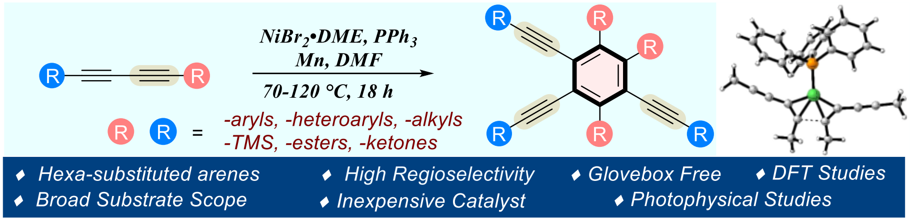
P-032

Ni^0-Catalyzed Regioselective [2+2+2] Cyclotrimerization of 1,3-Diynes and Mechanistic Insights

Rajesh Chakrabortty, Suman Ghosh, Venkataraman Ganesh*
Department of Chemistry, Indian Institute of Technology Kharagpur, Kharagpur-721302, West Bengal, India
E-mail: ganesh.v@chem.iitkgp.ac.in

Abstract :

We have recently developed a Ni^0-catalyzed regioselective [2+2+2] cyclotrimerization of 1,3-diynes to access alkynylated hexa-substituted arenes.[a] A diverse variety of substrates, their various photophysical properties, and mechanistic aspects were studied thoroughly. Hexa-substituted arenes have significant applications as functional materials and pharmaceuticals.[b,c] Our protocol exhibited remarkable versatility, transforming 1,3-diynes with diverse alkyl, aryl, and heterocyclic groups to the corresponding hexa-substituted arenes. We have also synthesized multivalent glycosystems, often showing wide applications in lectin binding, drug delivery, and material sciences.[d] Control experiments and density functional theory (DFT) studies facilitated the elucidation of the underlying mechanism governing the regioselectivity. Furthermore, the HSBs with extended conjugation displayed intriguing absorption and emission characteristics.



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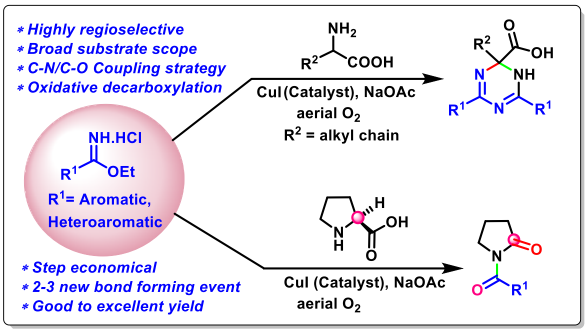
P-033

Cu(I)-Catalyzed $C(sp^3)$-H Functionalization of Amino Acids with Benzimidate and ROS to Synthesize Triazines and 2-Pyrrolidinones

Subhasis Pal[¶§], **Rajesh Nandi**[¶§], Dilip K. Maiti[*]
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, India.
E-mail: dkmchem@caluniv.ac.in, [§]SP and [§]RN have contributed equally

Abstract:

An easily accessible Cu(I)-catalyzed *regio*-selective oxidative C-N/C-O cross-coupling organic transformation has been disclosed for the syntheses of variably functionalized triazines and *N*-benzoylpyrrolidin-2-ones through the involvement of $C(sp^3)$-H bond functionalization, which is unknown in the literature. This general synthetic method is extended for decarboxylative oxidation of amino acids to install carbonyl functionality. It facilitates the formation of 2-3 new bonds through the cross-coupling strategy involving benzimidates, amino acids, and *in situ* generated reactive oxygen species (ROS) from the aerial O_2 as the sole oxidant. The key utilities of the new reactions are demonstrated by its operational simplicity, regioselectivity, robustness, and broad substrate scope.



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P-034

Two-Pot Synthesis of Naphthalene-Based Phase Selective Organogelator via Thiolactone Ring Opening and Comprehensive Oil Spillage Remediation

Sayani Das, Mijanur Rahaman Molla*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: dassayani64@gmail.com, mrmchem@caluniv.ac.in

Abstract:

Synthesis and design of low molecular weight organogelators have exhibited immense potential in recent decades due to their diverse application in fields such as cosmetics[1a], biomedicine[1a], and oil spill recovery[1a]. People view phase-selective organogelators (PSOGs) as a promising method for oil spill cleanup. However, they are often synthesised by following complex and multistep synthesis procedures that involve additional and tedious purification steps. Based on previous literature, it is difficult to accomplish a thorough, selective, eco-friendly, and energy-efficient separation of various and complicated kinds of oil spillages[1b], such as floating oil from contaminated aqueous phase. We demonstrate a facile, catalyst-free, two-pot synthesis of a compound via a thiolactone ring-opening reaction without demanding any additional purification processes[1d] (e.g., column chromatography). The gelation behaviors and properties of this derivative in relation to organic liquids such as hexane, methylcyclohexane, and diesel were examined through processes involving heating and cooling, stirring, or resting operations[1c]. The rheological measurements revealed the thixotropic nature of the gels by step-strain experiments at room temperature. The thermodynamic parameter (ΔHm) of gel-to-sol transition was determined for all the gels to get more insight into the gelation property by studying Fourier transform infrared, UV spectroscopy, and X-ray diffraction. The reusability of the gelator, coupled with the exceptional mechanical and chemical stability of the oil gels, as well as the gelator's nontoxicity in aquatic environments, underscores its significant potential for application in marine oil spill remediation[1e].

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P-035

Photoswitchable polyurethane based nanoaggregates for on-command release of noncovalent guest molecules

Subhadeep Kar, Soumya Kolay, Mijanur Rahaman Molla*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: mrmchem@caluniv.ac.in

Abstract:

The self-assembly of light responsive amphiphilic polymers has been of great interest in spatially and temporally controlled drug delivery [1] applications. The design, synthesis, and characterization of an amphiphilic main chain azobenzene polyurethane as well as its self-assembly in an aqueous environment, are presented in this work. This polymer exhibits hydrophobic guest encapsulation with good encapsulation stability (probed by FRET experiment) and self-assembles into a micellar nanostructure [2] (examined by dynamic light scattering and scanning electron microscope imaging).The photoswitching (trans-to-cis) of these nanoaggregates has been investigated by irradiation with UV light (λ= 365 nm), which results significant change in the hydrophobic environment and molecular arrangement in the micellar core. This leads to encapsulated guest release in a controlled manner as probed by UV-vis spectroscopy. Additionally, using zeta potential measurements, we showed that tumor-relevant pH (~6.5–6.8) caused surface charge modification (from neutral to positive). We think that the development of delivery systems for the targeted and regulated distribution of therapeutic molecules will be greatly impacted by the light-responsive guest release and pH-specific charge regulation.

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P-036

Nickel-catalyzed Intramolecular Alkene-Aldehyde Reductive Coupling and hydroalkenylation Strategies for *syn*-Selective Chromanol Skeletons

Sudipta Ghosh, Arnab Rooj, Aankhi Khamrai, and Venkataraman Ganesh*
Department of Chemistry, Indian Institute of Technology Kharagpur, Kharagpur – 721302, INDIA
e-mail: ganesh.v@chem.iitkgp.ac.in

Abstract:

Syn-chromanol motif is a fundamental structural feature in various bioactive natural products, pharmaceuticals and drug molecules.[1] We have demonstrated a nickel(0)-catalyzed intramolecular reductive coupling of *O*-allylsalicylaldehyde using to afford chromanol compound with exclusive *syn* selectivity.[2] We have successfully addressed two major challenges of this reaction: (a) Tsuji-Trost type deallylation of *o*-homoallyloxy benzaldehyde to give salicylaldehyde back (b) competing hydrosilylation of aldehyde moiety in presence of silane.[3] This methodology is applicable for both terminal and internal alkenes. The choice of reducing agent is very crucial to control reactivity of 5-membered nickelacycle intermediate towards reductive and β-hydride elimination pathways. A wide range of electron-rich/electron-deficient allylsalicylaldehyde provided the desired *syn*-chromanol derivatives in good to excellent yields. Our methodology is also tolerated with *o*-allyl/*o*-homoallyl benzaldehyde and N-allylanthranilalehyde. Using this methodology, the formal synthesis of drug molecules like **CP-85.958**, **CP-199,330** have been demonstrated.

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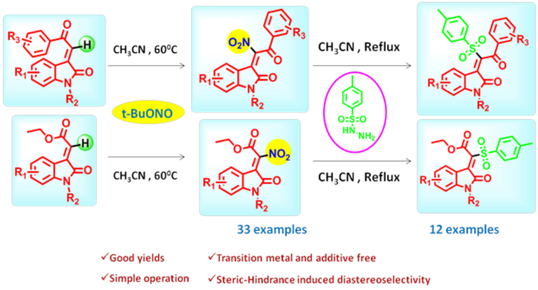
P-037

Steric-Hindrance Induced diastereoselective radical nitration of 3-alkylidene-2-oxindoles followed by tosyl hydrazine mediated sulfonation: An operationally simple, metal /additive free transformation

Sayan Pramanik, Chhanda Mukhopadhyay*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: sayanprm94@gmail.com; cmukhop@yahoo.co.in[a*]

Abstract:

A metal-free radical nitration of β C-H bond of 3-alkylidene-2-oxindoles[1] with *tert*-butyl nitrite (TBN) has been explored. Interestingly, (*E*)-3-(2-(aryl)-2-oxoethylidene)oxindole and (*E*)-3-ylidene oxindole gives different diastereomer on nitration.The mechanistic investigation revealed the diastereoselectivity was controlled by size of the functional group. Another transformation of 3-(nitroalkylidene) oxindole towards 3-(tosylalkylidene) oxindole was performed through metal and oxidant free tosyl hydrazine mediated sulfonation.[2] Both methods have the advantages of readily available starting materials and operational simplicity.



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P-038

Exploring Iridium (III) Complex Photocytotoxicity Against Hypoxic Cancer

Sumit[a], Ritika Jaswal[b], Aniruddha Roy[b] and Inamur R. Laskar*[a]
[a]Department of Chemistry, Birla Institute of Technology & Science (BITS), Pilani Campus, Pilani, Rajasthan, India, 333031
[b]Department of Pharmacy, Birla Institute of Technology & Science (BITS), Pilani Campus, Pilani, Rajasthan, India, 333031
E-mail: sampunia0908@gmail.com, ir_laskar@pilani.bits-pilani.ac.in

Abstract:

Cancer is an existential threat to human life, with an estimated 19.3 million new cases and nearly 10 million deaths worldwide in 2020.[1a] Considering the risk of cancer to human life and the advantages of PDT for cancer treatment, the current research explores the NIR-emitting Iridium (III) complex,[1b,1c] RM2 as an effective photosensitizer (PS) for PDT. Starting from the factors of effective PSs, RM2 singlet oxygen generation ability ($^1O_2$) was studied using DPBF as a standard dye for $^1O_2$ detection. Briefly, a solution of RM2 (10μM) and DPBF (50μM) was prepared in ACN solvent and then irradiated for different intervals of time (0-300s). Additionally, the $^1O_2$ generation efficiency of RM2 (Φ_Δ = 73% in ACN) was calculated using $[Ru(bpy)_3]Cl_2$ as a standard reference of $^1O_2$ for metal-based PSs. Also, RM2 generates superoxide (O_2^-), a type-I ROS confirmed through EPR spectroscopy. All these studies indicate RM2 as an effective PS for PDT. During the in-vitro study against the B6F10 cancer cell line, it was found to have low dark toxicity, but significant cell toxicity once exposed to light, even under low oxygen conditions with a half-maximal inhibitory concentration (IC50) of 186 nM. This work emphasizes the importance of the Iridium (III) complex as an important class of PS for PDT against hypoxic cancer.

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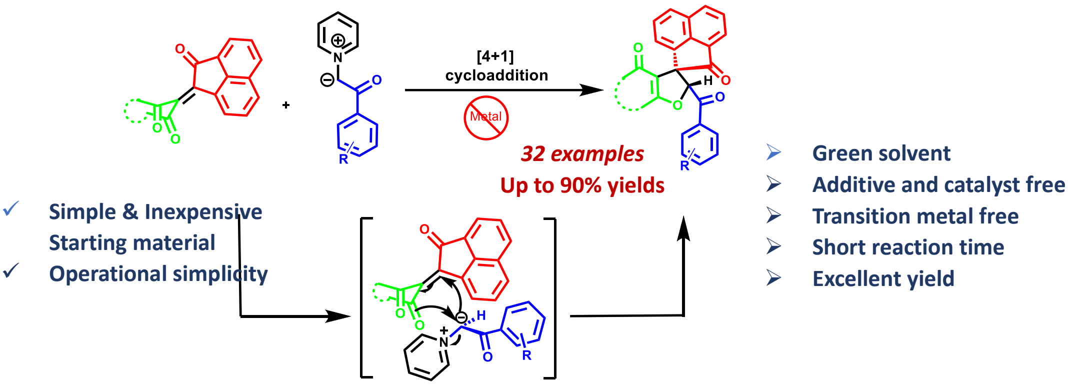
P-039

One pot pyridinium ylide assisted domino reaction for the diastereoselective synthesis of spirofused furans in water

Supratim Das [a], Soumyadip Basu [a], Supriyo Halder [b], Chhanda Mukhopadhyay [a]*
[a]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
[b]Department of Chemistry, Jadavpur University, Kolkata-700032, INDIA
e-mail: cmukhop@yahoo.co.in

Abstract:

A robust and efficient synthesis of novel 6',7'-dihydro-2H,2'H-spiro[acenaphthylene-1,3'-benzofuran]-2,4'(5'H)-dione scaffolds was developed from acenapthenequinone, cyclic-1,3-diketone, phenacyl bromide and pyridine. The reaction was short in duration and did not require an expensive metal catalyst or ligands. Furthermore, the reaction takes place under mild reaction conditions in an aqueous medium, and the products are produced in good to outstanding yields. The use of easily available starting materials and easy reaction conditions are the primary benefits of this method.



The convergent synthetic pathway makes it simple to add variety of substituent to the outermost regions of heterocyclic ring systems. Our approach could comprise the relay processes of the following domino sequences of (1) two component Knoevenagel reaction, (2) [4+1] cycloaddition reaction followed by the removal of pyridine moiety.

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P-040

A dual-channel chemodosimetric sensor for selective detection of hypochlorite and nerve agent mimic DCP: application in human breast cancer cells

Uday Narayan Guria,[a] Moumi Mandal,[b] and Ajit Kumar Mahapatra*[b]
[a]Department of Chemical Sciences, Biswa Bangla Biswabidyalay, Bolpur, Shibpur, Birbhum- 731204
[b]Department of Chemistry, Indian Institute of Engineering Science and Technology, Shibpur, Howrah 711 103, India. e-mail: akmahapatra@chem.iiests.ac.in

Abstract:

Nerve agents such as Sarin, Soman, and Tabun are very poisonous organophosphate derivatives.[a] Their potent electrophilic nature enables irreversible binding to acetylcholinesterase (AChE), butyryl cholinesterase, and erythrocyte cholinesterase, leading to serious biological impacts. Reactive oxygen species (ROS) such as hypochlorous acid (HOCl), a byproduct of myeloperoxidase (MPO) activity in leukocytes,[b] play a crucial role in immunity by combating bacteria and pathogens. Excess HOCl can induce oxidative stress, contributing to conditions such as cardiovascular disease, osteoarthritis, and cancer.[c] Rapid and sensitive detection of nerve agents and HOCl is crucial for public health and safety. Fluorescent probes, featuring reactive moieties attached to organic fluorophores, offer advantages like fast response and high sensitivity.[d] Due to the electrophilic nature of diethyl chlorophosphate (DCP),[e] sensors with nucleophilic groups (e.g., amino, hydroxyl) exhibit spectral changes via mechanisms like intramolecular charge transfer (ICT), photoinduced electron transfer (PET), and aggregation-induced emission (AIE). Similarly, functional groups like oximes, selenides, and thioethers are reactive toward hypochlorite (OCl^-).

Recently we designed and synthesized a styryl bridge containing a triphenylamine–thioimidazole hydrazine-based dual-analyte-responsive fluorescent sensor for the detection of nerve gas simulant diethyl chlorophosphite (DCP) and hypochlorite (OCl^-) for the first time. Hypochlorite induces oxidative intramolecular cyclization to give a triazole structure, which exhibited blue fluorescence with excellent selectivity and a low detection limit (8.05×10^{-7} M) in solution. Conversely, the probe forms a phosphorylated intermediate with diethyl chlorophosphate, which undergoes further hydrolyzation and presents green fluorescence in a ratiometric mode with a low detection limit (3.56×10^{-8} M). Additionally, the as-designed sensor was utilized to construct a portable kit for real-time monitoring of DCP in a discriminatory, simple, and safe manner. Lastly, the probe was also productively employed for in situ imaging of OCl^- and DCP in the living cell.

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P-041

Adsorption and activation of CO_2 on the surface of Ti-dopped Zr_6 clusters

Maksuda Khatun, Nitish Roy and Mahendra Nath Roy*
Department of Chemistry, University of North Bengal, Raja Rammahunpur, Darjeeling -734013, INDIA
e-mail: maksuda170391@gmail.com

Abstract:

Carbon dioxide (CO_2) conversion into value-added chemicals is an appealing alternative for reducing the world's rapidly increasing CO_2 emissions. Zirconium (Zr), among the non-precious and abundant metals investigated thus far, is one of the best electrocatalysts for converting CO_2 into various hydrocarbons and alcohols. We give a computational analysis of how clusters, doping, and support affect the adsorption and activation of Ti-dopped Zr clusters. Density functional theory calculation-based *ab initio* method was performed to investigate the feasibility of activating CO_2 with small size Zr_6 clusters, specifically Ti-dopped Zr clusters. First, we looked at the structure, stability, and electrical properties like HOMO-LUMO band gap, Mulliken charge analysis of Zr_6 and Ti-dopped Zr clusters, as well as their ability to adsorb and activate CO_2. Our calculations show that CO_2 undergoes chemisorption and activation, resulting in C-O bond elongation of 1.32-1.42 Å compared to 1.16 Å for free CO_2 and a distortion of the O-C-O bond angle from linear to 118-132°. The activation process involves charge movement from Zr_6 and Ti-dopped Zr clusters to the CO_2 molecule, resulting in the creation of $CO_2^{\delta-}$species. This work reveals that the Ti_3Zr_3 cluster is a potential candidate for the adsorption and activation of the CO_2 molecule.

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P-042

Design, Synthesis, and Biological Evaluation of Bis-Arylidene Oxindoles for Colorectal Cancer Nanotherapy

Debojyoti Das[a], Tanushree Mishra[a], Tithi Bhattacharyya[b], Rajkumar Banerjeeb, Susanta Sekhar Adhikaria*
[a]Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
[b]Division of Oils, Lipid Science & Technology, CSIR-IICT, Hyderabad 500007, INDIA
e-mail: ssachem@caluniv.ac.in

Abstract:

Oxindoles are known for their potent biological activities1 like anticancer, antimicrobial, antifungal, anti-tubercular, antiviral and antirheumatic agents etc. Traditionally, they have been used as estrogen receptor (ER)-targeted agents for treating ER(+) cancers. The bis-arylidene oxindole, Oxifen (OXF)1, previously developed by our group, effectively targets ER(+) cancer cells and shares structural similarities with Tamoxifen, a potent commercially available anti-cancer drug. In this study, we synthesized several structural analogues of OXF, including ACPOX and ACPOXF2, to assess their cytotoxicity in various cancer and non-cancer cell lines, as well as their ability to form self-aggregates in aqueous solutions. Among the synthesized compounds, ACPOXF exhibited the highest toxicity against colorectal cancer (ER(-)) cells. However, it also showed cytotoxic effects on non-cancerous HEK-293 cells, diminishing its cancer cell selectivity. Interestingly, ACPOXF demonstrated the ability to self-aggregate in aqueous solution without requiring a co-lipid, forming nanometric-sized aggregates. To enhance its anticancer potential, we co-formulated ACPOXF self-aggregates with dexamethasone (Dex)[3], a synthetic glucocorticoid receptor (GR) ligand, resulting in the ACPOXF-Dex aggregate. This formulation selectively targeted ER(-) colorectal cancer cells, significantly improving the survival rate of colon-tumor-bearing mice. Mechanistically, ACPOXF-Dex induced upregulation of reactive oxygen species (ROS), leading to apoptosis through caspase-3 activation. In conclusion, the structural modification of Oxifen to create ACPOXF enabled self-aggregation and facilitated the delivery of a GR-ligand. This modification broadened the compound's anticancer activity and enhanced its selective targeting of colorectal cancer, offering potential as a novel therapeutic approach for colon cancer treatment.

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P-043

Polydiacetylene (PDA) Based Sensory Systems

Ankit Thakuri, Mainak Banerjee, Amrita Chaterjee
Department of Chemistry, BITS-Pilani, K.K. Birla Goa Campus, NH 17B, Bypass Road, Zuarinagar, Sancoale, Goa-403726, INDIA.
E-mail: p20210014@goa.bits-pilani.ac.in

Abstract:

PDAs bear an alternating ene-yne structure that on exposure to UV irradiation (254 nm) display a characteristic blue color. When subjected to an external stimulus such as temperature and pH changes, or variation in the chemical environment, or electrostatic interactions, PDAs display visible color change from blue to red that arises from the stress in the molecular backbone of the polymer [1]. In addition to the chromatic change, PDAs also display fluorimetric changes from blue (non-fluorescent) to red phase (fluorescent) allowing their use as fluorimetric sensors. PDA based systems have therefore been utilized for a range of sensors. With our ongoing work {2} in polydiacetylene based sensors we have devised sensors for a range of analytes including anions, cations, biologically important amines. Currently we are focused on the morphological and materialistic applications of PDA. Through co-doping we are currently we have been able to alter the self-assembly shapes and color transition of PDA.

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P-044

Light controlled anticancer activity of STAT-3 inhibitor: design, synthesis and biological activity

Satyajit Bera and Subhas Samanta*

Abstract:

Chemotherapy is considered as one of the leading cancer treatment methods. However, the systemic distribution of cytotoxic drugs reduces its efficacy and causes severe side effects due to nonselective toxicity. Photopharmacology offers a novel approach to address these problems by allowing external, local activation of chemotherapeutic agents by using light[1]. As photoswitchable molecule such as azobenzene is capable of altering large structural change between trans and cis isomers, its attachment with a drug may lead to the generation of light-responsive drug with two isomers: one isomer is expected to be non-toxic and other to be toxic.[2,3] Application of such drug in combination with light could potentially eliminate off-target effects of any drug especially an anticancer drug. Here, we represented the light responsive analogue of STAT3 inhibitors which has great potential for site specific anticancer treatments.

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P-045

Solvothermal Synthesis and Characterization of High-Quality Graphene

Shib Shankar Biswas ,1,2 , Anirudha Mondal 1 , Hari Shankar Biswas 1 *, Dilip Kumar Maiti 3 #
1* Department of Chemistry, Surendranath College, 24/2, Mahatma Gandhi Road, Kolkata-700 009, India
1 Harindanga High School, Harindanga, Falta-743504, West Bengal, India
2 Department of Physics, Surendranath College, 24/2, Mahatma Gandhi Road, Kolkata-700 009, India
3# Department of Chemistry, University of Calcutta, University College of Science, 92, A. P. C. Road, Kolkata-09, India

Abstract:

Graphene oxide (GO) has gained considerable attention due to its unique properties, including high surface area,tunable surface chemistry, and electrical conductivity, making it an attractive material for a wide range of applications.In this work, we report a novel solvothermal method for the synthesis of high-quality GO from natural graphite. The method involves the oxidation of graphite in an aqueous solvent medium under solvothermal conditions, specifically using a mixture of concentrated sulfuric acid and other solvents, at temperatures ranging from 180 to 220°C. The solvothermal treatment facilitates the uniform oxidation of graphite, leading to the introduction of oxygen-containing functional groups, such as epoxides, hydroxyls, and carboxyls, onto the graphene sheets. The synthesis process is optimized to control the degree of oxidation, ensuring the production of GO with a high level of surface functionalization and minimal defects. The prepared GO samples are thoroughly characterized using a range of advanced techniques. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) reveal the morphology and structure of the GO sheets, showing predominantly few-layer graphene oxide with a smooth surface and large lateral dimensions. X-ray diffraction (XRD) analysis indicates a characteristic interlayer spacing corresponding to the oxygenated functional groups, while Raman spectroscopy provides insight into the defect density and structural integrity of the GO. Fourier-transform infrared spectroscopy (FTIR) further confirms the presence of various oxygenated functional groups on the graphene surface, validating the successful oxidation process. Raman spectroscopy highlighted the defect density with distinct D and G bands, while scanning electron microscopy (SEM) provided insight into the film's morphology, showing well-dispersed, layered structures. Thermal gravimetric analysis (TGA) exhibited GO’s thermal stability and decomposition profile, affirming the structural robustness of the synthesized thin film. This efficient solvothermal method shows promise for scalable GO thin-film production. The solvothermal approach is shown to offer several advantages over conventional methods, such as improved reproducibility, enhanced yield, and more controlled oxidation, which results in GO with superior quality. Furthermore, the produced GO exhibits good dispersion in aqueous and organic solvents, a critical property for many potential applications. The high-quality GO obtained in this study holds significant promise for use in energy storage devices (e.g., supercapacitors and batteries), sensors, water purification, and composite materials, due to its excellent electrical conductivity, surface area, and functional group content. This work highlights the effectiveness of solvothermal synthesis as a reliable and scalable route for producing high-quality graphene oxide, contributing to the advancement of graphene-based materials for various industrial and technological applications.

P-046

Reducing agent-triggered templated synthesis of a dynamic covalent poly(disulfide)s nanonetwork: remarkable tuning in noncovalent encapsulation stabilities and cargo release

Shuvajyoti Sarkar, Arun Mondal, Mijanur Rahaman Molla*
Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
e-mail: mrmchem@caluniv.ac.in

Abstract:

Multiple copies of dynamically reversible disulfide linkages give poly(disulfide)s their reputation as sustainable smart materials. In the presence of chemical or physical stimuli, the disulfide bonds can be readily broken and exchanged by surpassing the bond dissociation energy of 60 kcal.mol^{-1}. Several stimuli, including as heat, light, oxidizing agents, or thiol-based nucleophiles, are used in the conventional production of poly(disulfide)s to induce polymerization.Here, we presented a novel approach to the templated synthesis of dynamic covalent nanonetworks [1] based on cross-linked poly(disulfide)s as a very stable delivery system for chemotherapeutic applications. The synthesis is accomplished by treating a nanoaggregate of an amphiphilic monomer based on biomass-derived lipoic acid with a reducing agent at room temperature in an aqueous medium and under open-air. By altering the ratio of monomer to reducing agent, the cross-linking density can be controlled. This offers the chance to optimize the kinetics of cargo release, noncovalent encapsulation stabilities, and the stability of the nanocarrier itself, which are crucial for drug delivery applications. Approximately 80% of the guests were released from the strongly crosslinked nanonetwork in a sustained manner under the simulated redox conditions of cancer cells. A certain mol% of the same reducing agent is used to achieve the controlled depolymerization of the polymer. Lastly, the polymer is treated with the external thiol [2] in the presence of an organic base to achieve the reversibility and recyclability of the poly(disulfide)s to the monomeric form.

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P-047

Synthesis of coumarin-appended benzo[4,5]imidazo[1,2-a]pyrimidines: A new class of DNA minor groove binding agent

Juheli Sadhukhan, Pabitra Mandal, Alomgir Shah Kabir, Smritimoy Pramanik, Susanta Sekhar Adhikari*
Department of Chemistry, University of Calcutta, Kolkata 700009
E-mail: adhikarisusanta@yahoo.com/ssachem@caluniv.ac.in

Abstract

Heterocyclic compounds containing nitrogen atoms have been broadly applied in pharmaceuticals. Thus, designing novel heterocyclic motifs has become an increasingly urgent mission for chemists1. Recently, attention has been paid to benzo[4,5]- imidazo[1,2-a]pyrimidine derivatives because of their biological activities2-4. A new mild, versatile, and efficient method for the one-step synthesis of substituted benzo[4,5]imidazo[1,2-a]pyrimidine has been developed by using Fe(III) catalyst involving a coumarin- β keto ester, 2 aminobenzimidazole, and various aldehydes. This atom economic synthetic method provides the products with excellent yields and has a wide range of substrate compatibility. The crescent-shaped nature of the compound was revealed from the X-ray crystallographic analysis of one representative compound (**4a**). Since DNA offers valuable insights for creating therapeutic medications that affect gene expression, it has been identified and described as the location of small molecule interaction. Isohelicity being one of the criteria for DNA minor groove binding5 our synthesized crescent-shaped coumarin benzimidazopyrimidines (CBPy) are expected to fit into the minor groove DNA. Though all the compounds show moderately high binding affinities, compound **4a** exhibited the strongest binding relationship with the DNA (*Kd* = 2.14 μM). A competitive binding study confirmed that the location of **4a** was closer to the Hoechst 33258 binding site (AT-rich region) in the minor groove of DNA. It was proved that the crescent shape and the presence of coumarin were crucial for binding CBPys with B-DNA structure.

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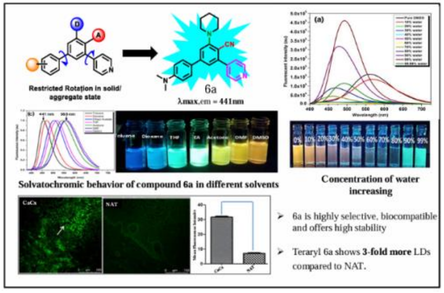
P-048

Donar – Acceptor Fluorescent Dyes and Quenchers for Biomedical Applications

Aradhana Chauhan, Chandra P. Sharma, Akansha Vyas, Monika Sachdeva and Atul Goel* Department of Medicinal and Process Chemistry, CSIR-CDRI, Sector 10, Jankipuram extension, Sitapur Road, Lucknow- 226031, INDIA
e-mail: chauhanardhu169@gmail.com

Abstract

Lipid droplets are engaged in many physiological functions as well as pathological circumstances. They also act as stores of cellular energy. The imaging of cellular organelles, including lipid droplets, mitochondria, ERs, and vacuoles, has drawn a lot of interest in fluorescent probes. We introduce nobel class of teraryl-based donor-acceptor-appended aggregation-induced emission luminogen (AIEgen), 6a, preferentially stains intracellular lipid droplets in the HeLa cancer cell line and live 3T3-L1 preadipocytes. In addition, we measured LDs in a human cervical cancer biopsy sample and found that there were three times as many LDs in malignant cells as there were in normal adjacent tissue (NAT).



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P-049

Organocatalyzed annulation of Cyclic Anhydrides with o-Alkynylanilines for the Construction of Fused N-Heterocycles

Aranya Das a ,Sk Ajarul b ,Sudipto Debnath c ,Poulami Hota d and Dilip K. Maiti*
a Department of Chemistry, University of Calcutta, 92, A. P. C. Road, Kolkata 700009, India
b Government General Degree College at Salboni, Bhimpur, Paschim Medinipur 721516, India
c Central Ayurveda Research Institute, CCRAS, Ministry of Ayush, Govt. of India, 4-CN Block, Bidhannagar, Sector-V, Kolkata 700091, India
c Milli Al-Ameen College (For Girls), 43, Beniapukur Ln, Beniapukur, Kolkata-700014, India
Corresponding author's email: dkmchem@caluniv.ac.in

Abstract

An organocatalyzed annulation reaction involves the use of small organic molecules to facilitate the formation of ring structures by combining two or more reactants. These reactions typically form carbon-carbon (C-C) or carbon-heteroatom (C-X) bonds, resulting infused or bicyclic systems, often with high selectivity1,2.Brønsted acids mediated, a robust synthetic strategy has been developed for the construction of valuable isoindolo/pyrido/pyrrolo-quinolinediones and isoindolo-indolones1. This approach involves annulation cyclization reactions between cyclic anhydrides or o-formylbenzoates and o-alkynylanilines. The metal-free Brønsted acid-catalyzed new [5+1] and [4+1] fused-cyclization provides an operationally simple, highly regioselective, atom-economical, high-yielding, sustainable, and catalytically efficient method.

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P-050

Efficient Synthesis of Oxazoles, 1,4-Oxazines, Oxazinones, and Acridones via Iodine Catalysis

Sudipto Debnath1, Aranya Das2, Manosi Das1, Gajji Babu3, and Dilip K. Maiti2*
1Department of Chemistry, Central Ayurveda Research Institute, CCRAS, Ministry of Ayush, 4-CN Block, Saltlake, Sector-V, Kolkata-700091,
2Department of Chemistry, University of Calcutta, 92 A. P. C. Road, Kolkata-700009, INDIA
3Department of Ayurveda, Central Ayurveda Research Institute, CCRAS, Ministry of Ayush, 4-CN Block, Saltlake, Sector-V, Kolkata-700091,
e-mail: *debnath1304@gmail.com, dkmchem@caluniv.ac.in*

Abstract

Iodine and iodine compounds in higher oxidation states have proven to be versatile and environmentally benign reagents for organic chemistry.[1] A notable recent development in this field recognizes iodines catalytic role in various oxidative reactions and transformations, leading to the formation of new C-O, C-N, and C-C bonds in organic compounds.[2]These catalytic transformations, in many cases, are very similar to the transition metal-catalyzed reactions but have the advantage of environmental sustainability and efficient utilization of natural resources. Iodine is an environmentally friendly and relatively inexpensive element underutilized in industrial applications.[3] An unprecedented metal-free cyclization catalysis reaction has been developed to synthesize 3-amino-4-benzoyl biphenyls and aryl-acridones in a highly regioselective manner with a high atom economy using catalytic K_2CO_3, an unusual rapid dual C−C coupled cyclization between β-keto enamines and cinnamaldehydes was achieved, yielding functionalized biphenyls. Additionally, in situ molecular I_2 catalysis enabled $C(sp^2)$−H functionalized C−N bond-forming cyclization, producing valuable aryl-acridones. 4 Furthermore, a metal-free sustainable strategy employing I_2catalysis under aerobic conditions facilitated a range of unprecedented transformations, including α,α-$C(sp^3)$-H functionalization, decarboxylative α-$C(sp^3)$-H functionalization, lactonized α-$C(sp^3)$-H functionalization, and α,β-$C(sp^3)$-H functionalized 5- and 6-annulation, as well as α-$C(sp^3)$-H activated 6-lactonization of primary aliphatic amines. This approach enabled the efficient synthesis of diverse five (5) and six (6)-membered polycyclic N,O-hetero aromatics such as oxazoles, 1,4-oxazines, and oxazin-2-ones with rapid reaction rates and high yields. These novel cyclization reactions, characterized by their high efficiency and sustainability, were mechanistically explored through control experiments and ESI-MS analyses. Unlike conventional methods, this technique does not require pre-functionalized amines, directing groups (DGs), transient DGs, metal catalysts, or traditional oxidants. The viability of the method was successfully demonstrated through the synthesis of labile chiral heterocyclic analogues. The synthesized compounds serve as potent organic nano-building blocks, enabling the construction of valuable organic nanomaterials with diverse sizes, shapes, and dimensions. These materials are being actively investigated for applications in innovative organic nanoelectronics and photophysical properties.[5]

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P-051

Solvent Driven Self-Assembly of Discrete Ni(II)-Azide Complexes :Unraveling Unusual Behavior in Mimicking Jack Bean Urease

Sneha Biswas* and Debasis Das*
Department of Chemistry, University College of Science, University of Calcutta, 92 A. P. C.Road, Kolkata 700009, India

Abstract

The well-known inhibitory strength of 3d metal Schiff base complexes against urease enzymes has long been acknowledged, but their untapped potential to act as ureolytic mimics of active metallobiosites has still remained unexplored. To break new ground, we present pyrrolidine-based monouclear Ni(II)-azide complex 1{[NiL(HL)(N 3)].1.5(H 2 O)} using N,N,O donor ligand namely (E)-4-bromo-2-(((2-(pyrrolidin-1-yl)ethyl)imino)methyl)phenol. While the initial spectrophotometric analysis showed catalytic inefficiency in methanol, since it undergoes unexpected ligand dissociation to generate new octahedral nickel complex (INC), catalyzing the condensation to form BrTz. Notably, complex 1 is subjected to self-assembling in DMF, into a UV-responsive tetranuclear complex 2 {[NiL(H 2 O)(N 3)] 4 } and structurally characterized using single crystal XRD. Furthermore, complex 2 was utilized as a functional urease model, demonstrating catalytic efficiency in urea hydrolysis with the estimation of liberated ammonia and CO 2 in MeOH. The mechanistic pathway has been speculated to proceed via hydrogen bonding of urea with bridging azides, facilitating its coordination with the nickel center.Moreover, it shows significant inhibition of hydrolysis in the presence of external NBPTO[N-(n-Butyl)thiophosphorictriamide], guanidine etc. revealing its potential for precise catalytic control.Best to our knowledge, this is the first case to report urease mimicking activity of tetranuclear Ni(II) complex and elucidating mechanism through detailed chemical analysis.

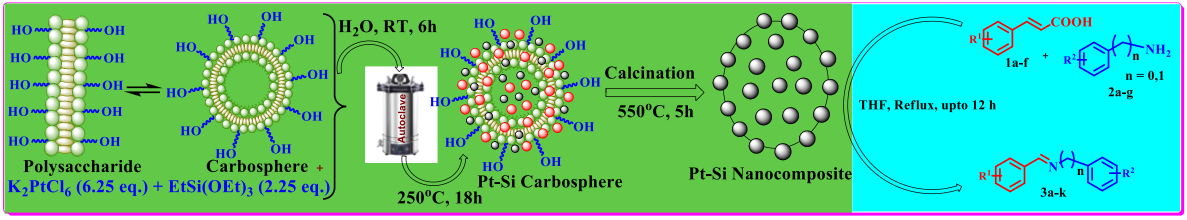
P-052

Green approach to access a novel carbosphere-nanofabricated platinum silicate-NP for unorthodox oxidative C=C cleavage-imination cascade via defunctionalization of functionalized olefins

Prakash K. Mandal[a], Anindya S. Manna[a] and Dilip K. Maiti[*a]*
Department of Chemistry, University College of Science, University of Calcutta, 92 A. P. C.Road, Kolkata 700009, India
Corresponding author email: dkmchem@caluniv.ac.in

Abstract

A benign, robust and efficient hydrothermal protocol for synthesizing new Pt-Si nanocomposite with an average size of 8 nm has been developed to achieve novel Pt-Si nanocomposite materials having a great potential as a magneficicent nano-catalyst for the unorthodox direct imine formation from olefins in form of cinnamic acids/esters/nitriles or simply styrenes with aryl/benzyl amines through a defunctionalization followed by oxidative cleavage of C=C bond. Due to the capacious utility of platinum nanoparticles (Pt NPs) in various fields along with C=C bond cleavage, it can be utilized a remarkable metal-based catalyst in diverse domains of research for target transformation in advancements of modern approach. Herein, we first report a unique Pt-Si nanocatalyst, accessed through an ecofriendly hydrothermal synthetic approach and utilized towards an innovative nanocatalyzed productive and unprecedented *in situ* straight-forward imination via an oxidative C=C cleavage of functionalized olefins. The major advantages of this work are associated with the greener access of a new nano-catalyst through an atom economic, prolific protocol, affording the imine in good yield avoiding use of harsh reaction strategy. Therefore, this finding would devise new domicile for the prime nanocatalyzed synthetic strategies for synthesizing the medicinally as well as materialistically valuable diversity oriented heterocycles or carbocycles, which may find entreaty in contemporary pharmaceutical, synthetic, biological and material sciences.



P-053

Soft-oxometalates (SOMs): crafting the pillars of a sustainable future

Tousif Al Amin, and Soumyajit Roy*
Department of Chemical Science, IISER Kolkata, Mohanpur, Nadia, 741246, INDIA
e-mail: taa23rs045@iiserkol.ac.in

Abstract

One of the most important challenges in developing new technologies and encouraging innovation is sustainability. The special qualities of soft-oxometalate, which include its capacity to capture energy for motion, partitioning, reactivity, and other purposes, open the door to the development of a sustainable framework. Making the processes of assembly and disassembly easier. The soft matter aspects are highlighted in this work. Especially their potential for use in electrocatalysis and photocatalysis transforming of CO_2 into simpler organic compounds (C_1 and C_2 products). By integrating these components as fundamental tenets, we hope to attain sustainable CO_2 transformation into simplified forms. Our group is committed to turning these ideas into products that are profitable.

References and Notes:

(1)G. H. Brundtland, World commission on environment anddevelopment, Environ. Pol. Law, 1985, 14(1), 26–30. (2)S. Dodds, Towards a 'science of sustainability': Improving the way ecological economics understands human wellbeing.Ecol. Econ., 1997, 23(2), 95–111. (3)S. Roy, Soft-oxometalates beyond crystallinepolyoxometalates: formation, structure and properties, CrystEngComm, 2014, 16(22), 4667–4676.

P-054

Synthesis of Acenaphthenone-2-ylidene ketones in PEG 400 under metal and acid free condition and their radical nitration by TBN in water

Tiyasa Dhar[a] and Chhanda Mukhopadhyay[a]*
[a]Department of Chemistry, University of Calcutta, 92 APC Road, Kolkata-700009, INDIA.
*E-mail: cmukhop@yahoo.co.in

Abstract

Synthesis of acenaphthenone-2-ylidene ketones has been developed using PEG 400 as a solvent in a metal and acid free condition (**Scheme 1**). On the other hand, controlled C-H functionalization is an evolution from the conventional organic synthesis approach.[1] As far as our knowledge goes, no report has been made about the C-H functionalization of β-H of acenaphthenone-2-ylidene ketones .From this angle, adopting a sustainable strategy that will enable β C-H functionalization of acenaphthenone-2-ylidene ketone is urgent . TBN has been developed rapidly as an acid and metal-free nitrating reagent because of its active chemical characteristics and capacity to react with a variety of functional groups.[2] Using TBN as a nitrating agent under atmospheric oxygen, nitration of acenaphthenone-2-ylidene ketone has been accomplished for the first time (**Scheme 1**).[3] Upon nitration, (E)-2-(2-oxo-2-phenylethylidene)acenaphthylen-1(2H)-one and alkyl (E)-2-(2-oxoacenaphthylen-1(2H)-ylidene)acetate give the diastereomer with same geometry. The variety of substrates employed and low cost and non toxicity of the chemicals used in this process demonstrate its important applicability. Another noteworthy aspect of the procedure is that, in contrast to previous procedures, it does not use HNO_3 or metal nitrates during the transformation.[4].

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P-055

Soft-oxometalates (SOMs): crafting the pillars of a sustainable future

Tousif Al Amin, and Soumyajit Roy*
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Abstract

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P-056

Synthesis of Acenaphthenone-2-ylidene ketones in PEG 400 under metal and acid free condition and their radical nitration by TBN in water

Tiyasa Dhar[a] and Chhanda Mukhopadhyay[a]*
[a]Department of Chemistry, University of Calcutta, 92 APC Road, Kolkata-700009, INDIA.
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Abstract

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P-057

Development of Quality Standards of AYUSH SS Granules by Chemical and Pharmacognostical Analysis

Manosi Das*, Sudipto Debnath, Shreya Dutta, Avijit Banerji, P.V.V. Prasad and G. Babu
Central Ayurveda Research Institute, CCRAS,
4 Minerva Road, CN Block, Sector V, Bidhannagar, Kolkata – 700091
E-mail: manosi_das@rediffmail.com

Abstract

In the global scenario the use of medicinal plant products is very firmly established for healthcare. It is imperative that rigorous analysis be done for quality control for standardisation of these products for the global acceptability of these drugs. In our Institute, we have been involved in the quality control and standardisation of indigenous drug formulations of the Indian traditional system of Ayurveda, using state-of the art techniques. We report here our work on AYUSH SS Granules, a unique Poly Herbal Formulation used for Enhancement of Lactation of Postnatal mother. This formulation is made from the raw drugs - fruits of *Elettaria cardamomum* (Sukshma Ela), *Anethum sowa* (Shatapuspa), *Cuminum cyminum* (Svetajiraka) and roots of *Asparagus racemosus* (Shatavari) along with sugar and preservatives.

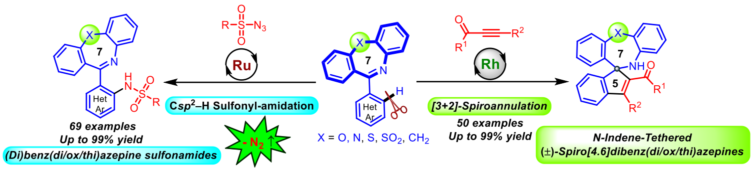
The quality assessment of AYUSH SS Granules was established through macroscopic, powder microscopic, fluorescence analysis (using several reagents under visible and UV light), physico-chemical properties and HPTLC fingerprinting and densitogram profiling. Photomicrographs, recorded digitally, of the prepared AYUSH SS Granules formulation revealed similar microscopical components or characteristics of raw ingredients present. Safety parameters were ascertained by heavy metals testing, pesticide testing (GC-MS-MS analysis), pathogens testing and aflatoxins testing. These were found to be within API limits. HPTLC profile was carried out with the AYUSH SS Granules-formulation and the four raw drug components and markers. Methanolic extracts of the materials were analysed over silica gel chromatoplates, with the use of Carvone and Cuminaldehyde as marker compounds. The characterisation parameters obtained during this current study provides the referential standards for quality control.

P-058

Dibenz(di/ox/thi)azepines as Seven-Membered Imine Directing Groups in Transition Metal (Ru, Rh) Catalyzed C–H Activation/Annulation

Koushik Naskar, Imtiaj Mondal, Shantonu Roy, Sudip Karmakar, Moumita Chowdhury, and Indubhusan deb*
Organic and Medicinal Chemistry Division, CSIR-Indian Institute of Chemical Biology
4-Raja S. C. Mullick Road, Jadavpur, Kolkata 700032, India.
e-mail: indubhusandeb@gmail.com, indubhusandeb@iicb.res.in

Abstract



The benzodiazepine (BZD) and dibenzo(di/ox/thi)azepine scaffolds, along with their analogues, are recognized as proven privileged seven-membered *N*-heterocyclic scaffolds in most tricyclic antidepressants (TCAs) and antipsychotic drugs used for sedative and anxiolytic purposes.[1a] In contrast, the seven-membered cyclic azepines have not yet been tested using the concept of C–H bond activation.[1b,c] Therefore, the functionalization of (di)benzo(di/ox/thi)azepines through this imine system is of significant importance from both medicinal and synthetic perspectives. An efficient one-pot Cp*Rh(III)-catalyzed [3+2]-spiroannulation reaction has been developed, enabling the synthesis of potentially biologically relevant (±)-spiro[4.6]benzo[1,4](di/ox/thi)azepine indenes from (di)benzo[1,4](di/ox/thi)azepines and ynones under mild and operationally simple conditions. This method accommodates a broad substrate scope with diverse functional group tolerances, allowing for the regioselective synthesis of a wide range of α-aroyl spiroindenamine-containing (di)benz(di/ox/thi)azepines in good to excellent yields.[1d] Additionally, we report an atom-economic one-pot Ruthenium(II)-catalyzed *ortho*-C*sp*^{2}−H activation/C−N bond formation reaction between (di)benz(di/ox/thi)azepines and azides. This method facilitates the synthesis of potentially biologically relevant novel sulfonamides[1e] containing dibenz(di/ox/thi)azepines, exhibiting diverse functional group tolerances. The reactions are functionally straightforward and in good to excellent yields under mild conditions, with nitrogen gas being released as a by-product.

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P-059

Substituent Driven Chemoselective Addition of Indole Derivatives to Donor Acceptor Cyclopropane: A Systematic Study Through Computational Approach

Kaushik Singha, Dibyendu Mallick, Koena Ghosh*
Department of Chemistry, Presidency University, Kolkata
86/1 College Street, Kolkata-700073
E-mail: koena.chem@presiuniv.ac.in

Abstract

Cyclopropanes are essential building blocks in organic chemistry due to their unique reactivity and strained structure. The incorporation of donor and acceptor group at vicinal position generates the "push-pull'' effect that has been synthetically exploited to access 1,3-functionalized compounds including annulated products. During the reaction initial ring-opened products often undergoes annulation by suitably positioning of complimentary functionality. Understanding the unique electronic balance that governs the ring-opening of Donor-Accepter Cyclopropane (DAC) followed by closing or towards other competitive pathways are therefore essential with respect to various reacting partners. [1]

Indoles are ubiquitous nucleophile that are largely exploited as reacting partners to DAC leading to various indole based scaffolds.[2] By skillfully adjusting the electronic and steric effects of the substituents' on both cyclopropane as well as on the nucleophiles, reaction conditions, solvent polarity, catalysts etc. could significantly alter the reaction pathways.[3] Modern research employing advanced computational studies enables chemists to understand and manipulate between the competing reacting pathways leading to better regio- or stereocontrol of the reaction. The present work examines the reactivity of indoles vs 4-substituted indoles towards ring-opening or ring-opening annulation of DAC enrouting medicinally important cyclopropane[b]indoles. The thermodynamic vs kinetic control of reaction is also studied with the help of computational approach. [4]

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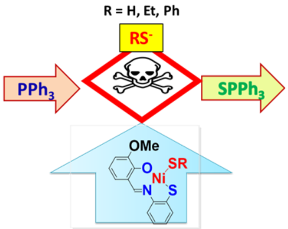
P-060

Anaerobic Catalytic Sulfur Atom Transfer Reaction from {Ni(II)-SR} Complex (R = H, Et, Ph): Implication to Sulfide oxidase function of Cu/Zn-Superoxide Dismutase and C-S Bond Cleavage

Surajit Das, Jayanta Bag, and Kuntal Pal*
Department of Chemistry, University of Calcutta, 92, A.P.C. Road, Kolkata700009, India
kpchem@caluniv.ac.in

Abstract



A set of Ni(II) complexes were synthesized and completely characterized by crystal structure and several spectroscopic techniques which are $[(NiL)_4]$ (**1**), $[NiL(PPh_3)]$ (**2**), $[NiL(SH)]^{-1}$ (**3**), $[NiL(SEt)LNi]^{-1}$ (**4**) and $[NiL(SPh)LNi]^{-1}$ (**5**) where **L** = (E)-2-methoxy-6-(((2-sulfidophenyl)imino)methyl)phenolate. Under anaerobic condition, **3** responses[2] catalytic sulfur atom transfer (SAT) reaction with PPh_3 to produce $SPPh_3$ leaving hydride as reducing equivalence in solution. The SAT reactivity pattern was compared with the detoxification of molar excess sulfide in mitochondria done by Cu/Zn containing superoxide dismutase[2] enzyme as the alternative cytosolic sulfide oxidase. On the other hand, complex **4-5** responded to the SAT reaction through C-S bond cleavage[3] induced by PPh_3 to produce $SPPh_3$ where the reducing equivalence was identified as carbanion (Et^- or Ph^-). In both type of SAT reaction, mechanistic understanding was explored based on detailed studies of mass, ^1H and ^{31}P NMR spectra.

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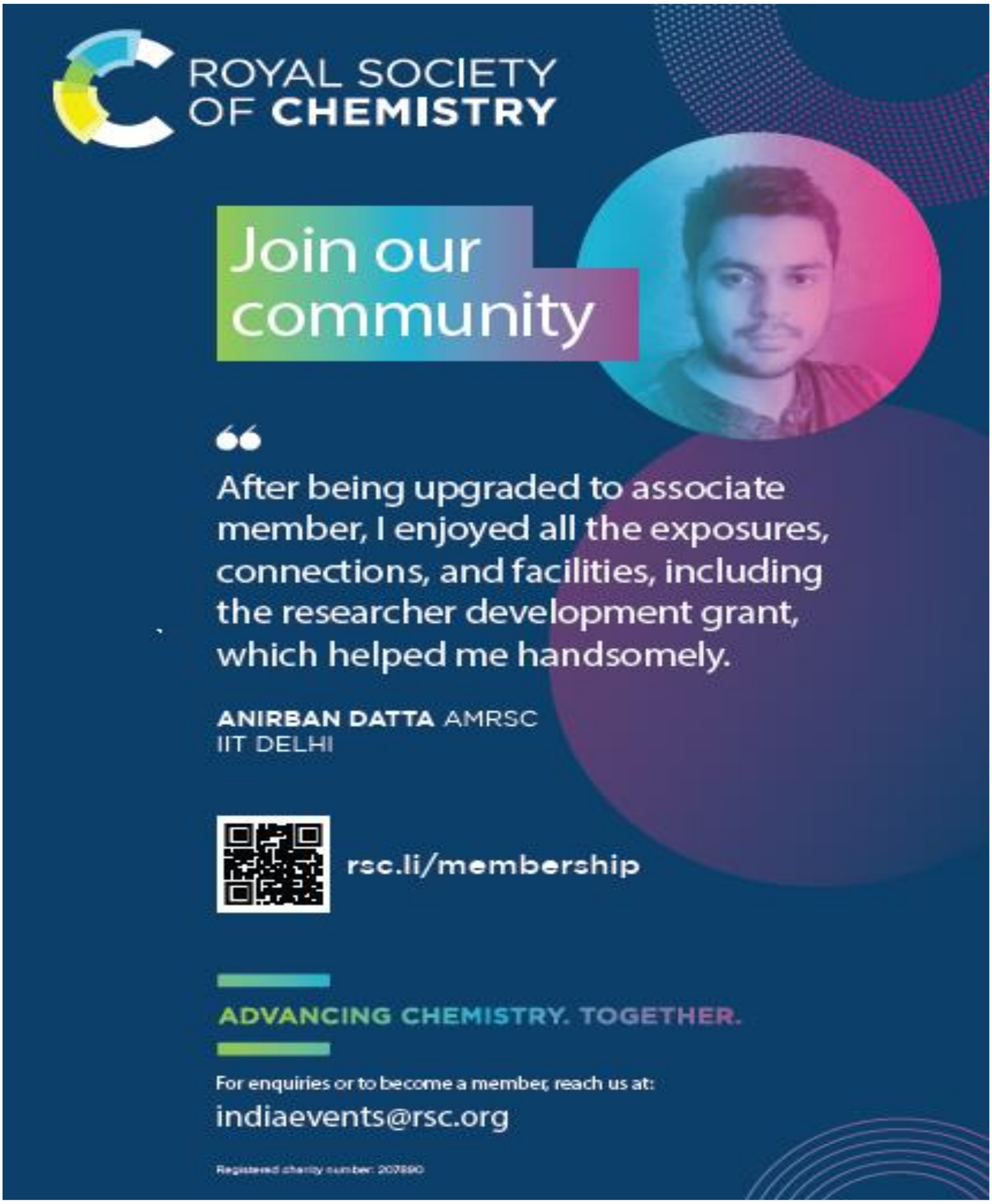

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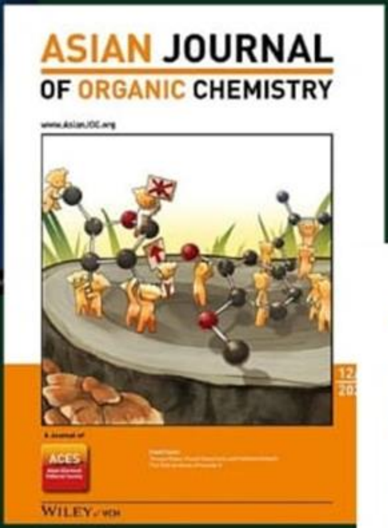

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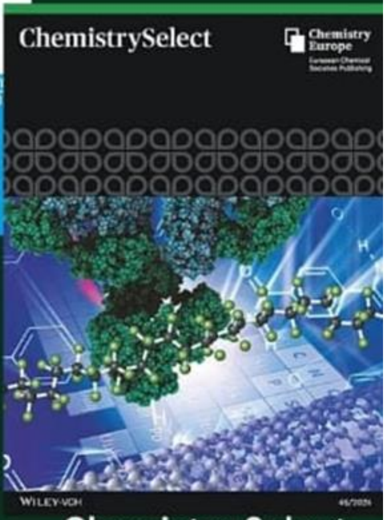

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