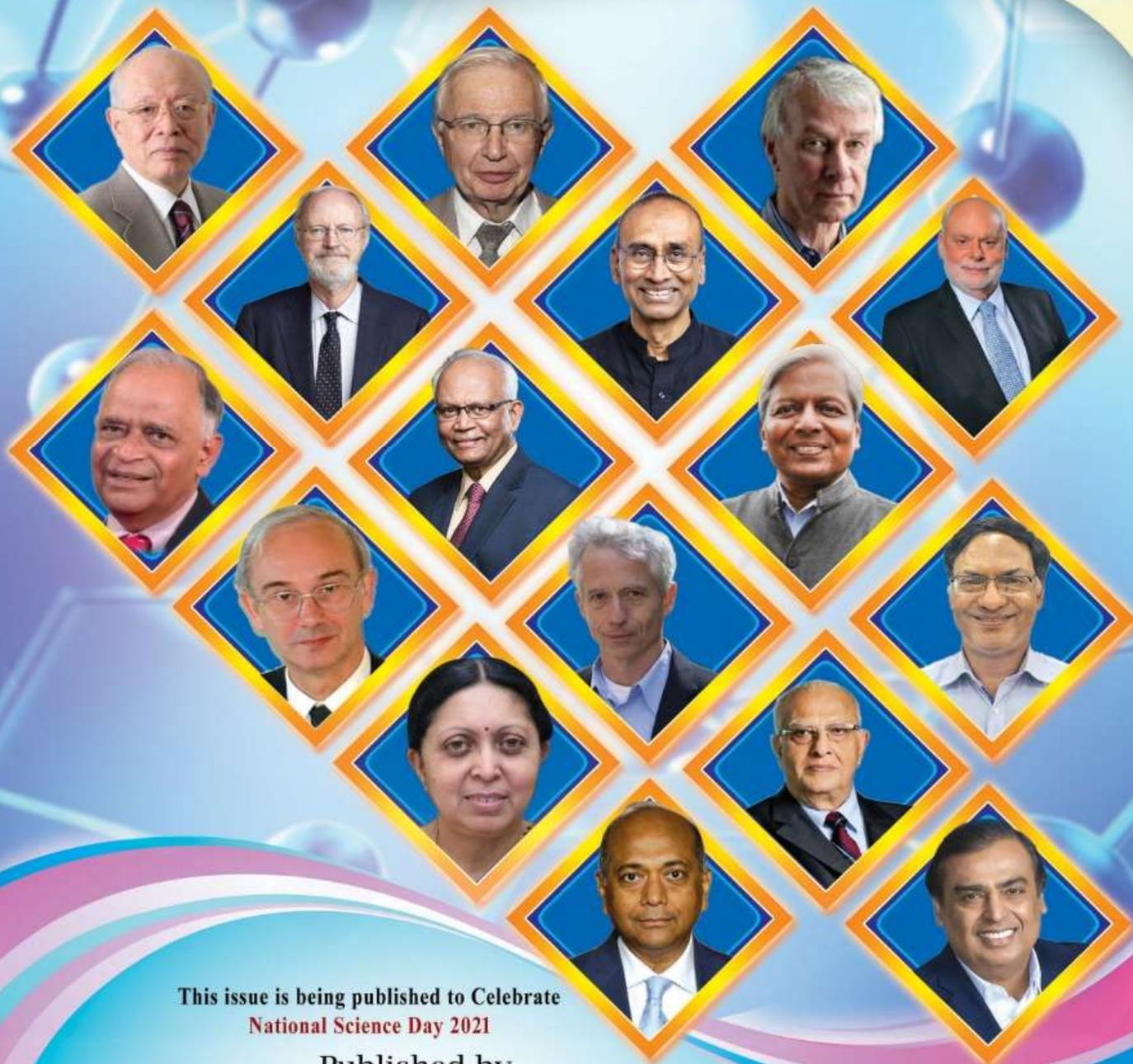


# CHEMICAL

# Warta



This issue is being published to Celebrate  
National Science Day 2021

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28<sup>th</sup> Feb.  
2021





## *Editorial-*

Dear Colleagues,

We are passing through difficult times because of Covid-19. Although the world has seen amazing medical discoveries in the past century yet, it is not equipped well enough to resist the devastations brought on by this terrible virus. As a result, it has hindered the everyday activities of all scientific societies. But with the capable leadership of our very dynamic President, Prof. Yadav, along with the office bearers and council members, the Indian Chemical Society has been raised to a great height even during the pandemic. For the first time, six Nobel Laureates and several eminent scientists and industrialist of India have become our honorary Fellows. To honor them, we have designed the cover page of this issue with their recent photographs.

The country's oldest chemistry research journal, The Journal of The Indian Chemical Society (J. Indian Chem. Soc.) is now being published by the renowned publisher, Elsevier from January 2021, and free copy of the first issue (2021, Vol 98, Issue 1) is already available online (<https://www.sciencedirect.com/journal/journal-of-the-indian-chemical-society/vol/98/issue/1>). The 'Introduction to the Inaugural Issues', explain beautifully the journey of the journal from 1924 to till date, ([doi.org/10.1016/j.jics.2021.100025](https://doi.org/10.1016/j.jics.2021.100025)) its current status and future scope.

The **57<sup>th</sup> Annual Convention of Chemists 2020 (ACC-2020)** and the **International Conference on Recent Trends in Chemical Science (RTCS-2020)** were successfully organized on December 26-29 in virtual mode. The programme was inaugurated by **Nobel Laureate Prof. Ryoji Noyori** of Japan. Prof. Noyori in his inaugural speech gave a valuable message; "Any innovation based on science and technology are truly directed in a way to provide all necessary goods and high-quality services to all kinds of people regardless of age, gender, religion or language thereby providing various comfortable and safe life for everyone". In his prolonged speech he also mentioned "Chemistry goes beyond mere observation and can generate very high-value products from almost nothing". Today's scientific research are more

interdisciplinary, transdisciplinary, or even antidisciplinary. Researchers must drive public opinion and governmental policies for enhancing public welfare and constructing a sustainable society. Global cooperation and collaboration are needed for the survival of our species.

On the Inaugural day of the Convention (26<sup>th</sup> December 2020), two eminent scientist of India, **Prof. Padmanabhan Balaram** of IISc Bangalore and **Prof. Debashis Mukherjee** of IACS Kolkata were felicitated with the **Lifetime Achievement Awards** of the Indian Chemical Society in recognition of their lifetime achievements in teaching and research in the field of Chemistry.

Fourteen Endowment Lectures were delivered by Eminent Scientists and Professors of Chemistry and Chemical Engineering of India in the Annual Convention.

The programme also included several invited lectures, paper presentation (ORAL/POSTER) delivered by scientists and academicians across the world. The Indian Chemical Society also encourages the budding young chemists of our country and abroad by organizing special award sessions to accommodate their contribution in different field of chemistry. Seventy convention awards were given to the young chemists. The Valedictory Lecture was delivered by **Prof. Jean-Marie Lehn, France, Nobel Laureate 1987**. Prof. Lehn, in his valedictory speech, talked about Supramolecular Chemistry, which is dynamic chemistry through non-covalent interactions. Together with the corresponding areas in physics and biology, supramolecular chemistry builds up supramolecular science, which involves complex substances of informed, self-organized, evaluative matter.

This issue of CHEMICAL WARTA depicts the brief reports of 57<sup>th</sup> **ACC-2020 & RTCS-2020**. A brief introduction of our new honorary fellows and two life-time achievement awardees also reported for the common interest. We have included the list of convention awardees (including Young Scientist Awardees to inspire them

them) of the 57<sup>th</sup> Annual Convention of Chemists (ACS-2020) with their institute affiliation and photos.

The brief summary of Prof. Noyori's and Prof. Lehn's talk will certainly be helpful to all chemical science students, teachers and researchers. It has certainly enriched the academic value of this issue and made it a special one. This volume of 'Chem Warta' also includes summary of research publications of six issues of JICS (March – August) out of which four are special issues (March, April, July and August).

We are thankful to all the Council members and Office Staff of the Indian Chemical Society for their cooperation and support to finalize this issue. Hope, like the previous issues, this will also bear interest to all readers.

The Indian Chemical Society deeply mourns the sad demises of the Fellows of the Society in the year 2020.

With Regards,

Dr. Nibedita Chakrabarti  
Editor

Dr. Gourisankar Roymahapatra  
Editor

Prof. Chittaranjan Sinha  
Editor-in-Chief



## Special Issue on CHEMBIOEN 2020 J. Indian Chem. Soc, March 2020

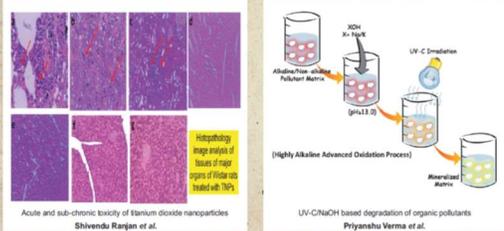
The special issue of JICS, March, 2020 published 35 selected articles delivered in an International Conference of CHEMBIOEN 2020 organized by Dr. B R Ambedkar National Institute of Technology Jalandhar in association with the Indian Chemical Society, Kolkata. The Guest Editors of this special issue were Dr. Shivendu Ranjan, Editor (Guest), JICS; Dr. Shishir Sinha, Indian Institute of Technology Roorkee, Roorkee; Dr. J K Ratan, Dr. Sangeeta Garg from NIT Jalandhar, and Dr. Priyanshu Verma, Bansal Institute of Engineering and Technology (BIET), Lucknow. All the articles published in this issue are available (open accessed) in the Society website [www.indianchemicalsociety.com](http://www.indianchemicalsociety.com)

This Special Issue highlights the scaling up perspective of post harvested agri-food products and also discusses optimized process design for pharmaceutical waste management. The cutting-edge research of nano(bio)technology has also been discussed which includes the thermo-physical properties, toxicology, and environmental applications. This issue also discussed the energy perspective of the chemical engineers in terms of the impact of different fuels in different fire compartments and chemical engineers kept their views on ceramic membrane for treating oily waste. The environmental and biotechnological perspectives of removal of hazardous medical waste as well as biosorption of heavy metals were also discussed. In a nutshell this Special Issue of CHEMBIOEN 2020 is a common and interdisciplinary viewpoint of bio-engineers, chemical engineers and environmental engineers.

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March 2020

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Retail Price : ₹ 500/US \$ 65

### JOURNAL OF THE INDIAN CHEMICAL SOCIETY



**Acute and sub-chronic toxicity of titanium dioxide nanoparticles**  
Shivendu Ranjan et al.

**UV-CN/NaOH based degradation of organic pollutants**  
Priyanshu Verma et al.

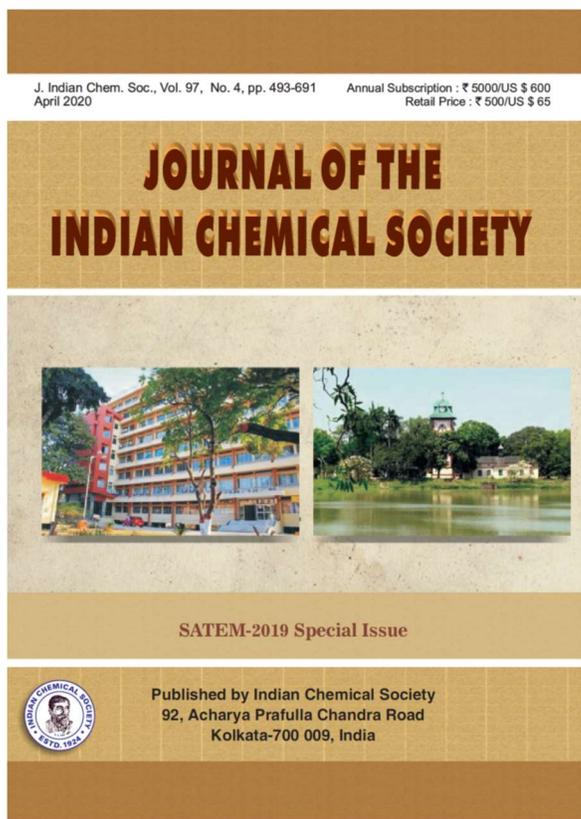
CHEMBIOEN-2020 Special Issue

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92, Acharya Prafulla Chandra Road  
Kolkata-700 009, India

## Special Issue on SATEM-2019 J. Indian Chem. Soc, April 2020

The special issue of JICS, April, 2020 has published 27 selected and peer-reviewed full-length research papers as a part of International Conference organized by the Sustainable Advanced Technologies for Environmental Management (SATEM 2019) during December (18 – 20), 2019 in the Indian Institute of Engineering Science & Technology, Shibpur, Howrah, West Bengal. The Guest Editors of this special issue were Prof. Debabrata Mazumder, Dr. Chanchal Majumder, and Dr. Asok Adak, Indian Institute of Engineering Science & Technology Shibpur, Howrah, West Bengal. Out of total number of 75 Extended Abstracts 40 were selected for full length paper. This issue is available (open accessed) in the Society website [www.indianchemicalsociety.com](http://www.indianchemicalsociety.com)

Abatement of environmental pollution presently poses a serious concern to the scientists, engineers and policy makers. In view of exponential fall in environmental quality due to abundant use of nonrenewable resources, the civilization is now in a verge of crisis around the world. With a view to address these issues, a variety of advanced technologies have been innovated; but most of them are not compatible for simplistic application. It also becomes challenging to sustain a new technology for a long span due to dearth of expertise. Under this scenario, all the innovative technologies for environmental pollution control should be economically viable as well as sustainable.



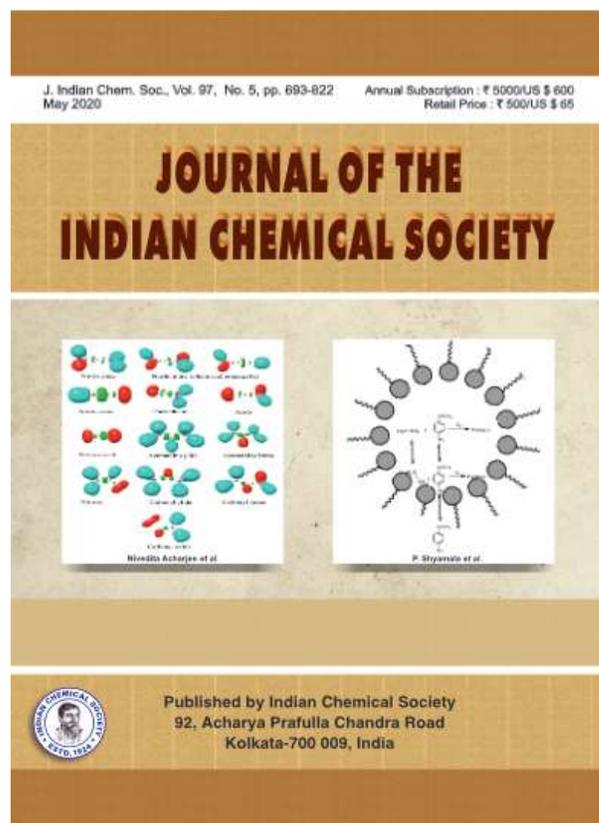
## May Issue

### J. Indian Chem. Soc, 2020

May 2020 issue of the Journal of the Indian Chemical Society contains seventeen original research articles in five different sections containing one review article, one article in Inorganic Chemistry Section; five articles in Physical Chemistry Section, five articles in Organic Chemistry Section; two articles in each Analytical Chemistry and Environmental Chemistry Sections of total 130 pages.

Two cover page articles of this particular issue are Comparative DFT analysis of ELF topology and global properties of allyl and allenyl type three atom components (TACs) by Nivedita Acharjee *et al* from Department of Chemistry, Durgapur Government College, West Bengal and Effect of CTAB reverse micelles on the kinetics of aminolysis of *p*-nitrophenyl acetate by hydrazine by P. Shyamala *et al* from Department of PNCO, School of Chemistry, Andhra University, Visakhapatnam, Andhra Pradesh.

Ali Kemal Garipet *al* from Turkey, studied the influence of boron impurity for the adiabatic charging energies of thiol-ended thiophene: A DFT study. Nanik Siti Aminahet *al* from Indonesia, studied a work on  $\beta$ -Sistosterol and  $\beta$ -sitosterone from *Eucalyptus deglupta*. Vahid Najafi Moghaddam Gilani *et al* from Iran, evaluated the surface free energy and moisture susceptibility of modified asphalt mixtures with nano hydrated lime under saturated conditions with deicer materials and distilled water. Manish Banerjee from Uttar Pradesh, reported a review paper based on analytical challenges in estimation of precious metals (Ag, Au, Pd, Pt) across a wide range of samples. B. Anupama from Hyderabad, reported a comparative study for the detection of metal on by Schiff base. Harichandra A. Parbat *et al* from Mumbai, studied a kinetic approach to the oxidation of some primary perfumery alcohols using ammoniummetavanadate in acidic medium. Joydeep Dutta *et al* from Haryana, reported the effect of degree of deacetylation and molecular weight on physicochemical properties of chitosan films. Nagendranath Mahata *et al* from West Bengal, reported a tuning of pore texture of carbon xerogels synthesized using resorcinol and paraformaldehyde as precursors. S. Manivannan *et al* from



Chennai, reported a kinetics and mechanistic study of oxidation of  $\beta$ -amino acid leucine by TCICA in aqueous acetic acid medium. K. M. Lokanatha Rai *et al* from Karnataka, reported the Synthesis, characterization, antibacterial evaluation and molecular docking study of 4-[[4-(5-phenyl-1,3,4-oxadiazol-2-yl)phenoxy]methyl]benzotrile derivatives. Anand S. Aswar *et al* from Maharashtra, reported a one pot synthesis of dexethylphenidate hydrochloride with chiral purity. R. Ranjith *et al* from Tamilnadu, reported the sulphide stress corrosion cracking of AA7050 hybrid composites. G. V. S. R. Pavan Kumare *et al* from Andhra Pradesh, reported withdrawal of Mn(II) from aqueous solution using low cost adsorbents: isothermal, kinetic and ANN modeling studies. Subhasish Das *et al* from Kolkata, reported the increasing threat on groundwater reserves due to seawater intrusion in Contai belt of West Bengal. P. Sanghamitra *et al* from IEST, Shibpur, West Bengal, reported a study on aerobic biodegradation of oil and grease containing wastewater.

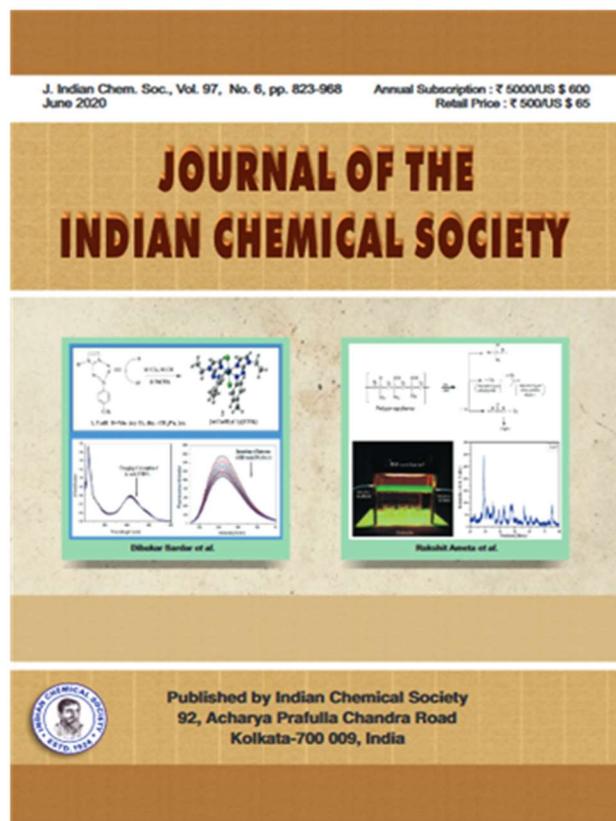
## June Issue

### J. Indian Chem. Soc, 2020

June 2020 issue of the Journal of the Indian Chemical Society contains sixteen original research articles in different section e.g. four articles in Inorganic Chemistry Section; six articles in Physical Chemistry Section, four articles in Organic Chemistry Section; one each in Analytical Chemistry and Environmental Chemistry Sections of 146 pages.

Two cover page articles of this particular issue are DNA binding study of Ir(III) complex by Dibakar Sardar *et al* from Department of Chemistry, Dinabandhu Andrews College, Garia, Kolkata and Photodegradation of polypropylene using CaO nanoparticles by Rakshit Ameta *et al* from Department of Chemistry, PAHER University, Udaipur, Rajasthan.

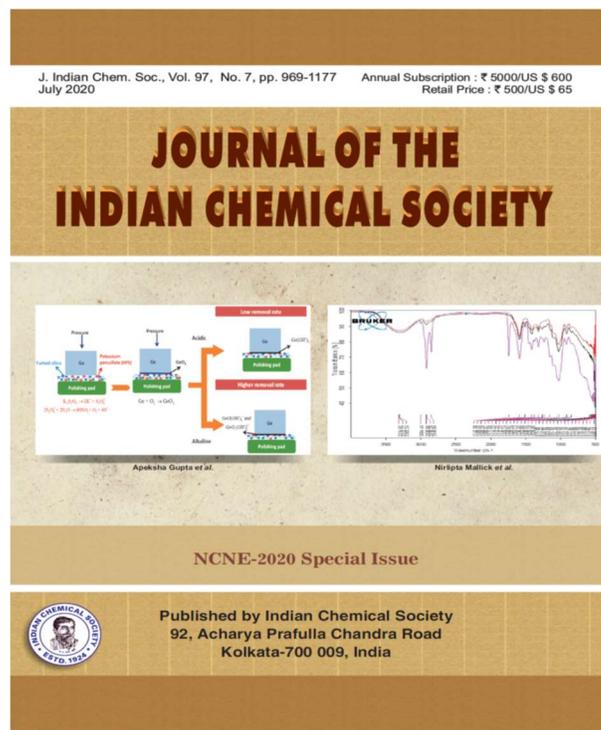
N. Feiziet *et al* from Iran reported the short-chain branching distribution in polyethylene by combined use of FTIR and TREF. Hassan Hassani *et al* from Iran, studied the synthesis, characterization and application of  $\text{Fe}_3\text{O}_4@\text{SiO}_2@\text{PrNH}_2\text{-Cu}$  towards synthesis of  $\beta$ -amino ketones. Aparna Das *et al* from Prince Mohammad Bin Fahd University, KSA studied the Stereoselective



synthesis of  $\beta$ -lactams under diverse conditions. Aswini Kalita from Assam reported the reactivity of enamine complex of Cu(II) towards breaking of C=C bond and formation of amide complex. R. N. Dutta Purkayastha *et al* from Tripura reported the synthesis and spectral characterization of fluoromanganate, manganate and fluorozincate complex. Bhaskar Biswas *et. al* from North Bengal University, West Bengal reported synthesis, characterization and catalytic oxidative coupling of 2-aminophenol. Abhiram Hens *et.al* from West Bengal investigates the CFD based microfluidic thermophoresis. Somnath Nandi from Maharashtra reported the study about hibiscus leaves extract towards green corrosion inhibitor. K. Bhargavi *et al* from Andhra Pradesh studied the effect of cetyl ammonium bromide micelles on decolouration of rosaniline hydrochloride by periodate. Meena Sarma *et.al* from Jammu & Kashmir reported the Acoustical studies of nickel nanoparticles based nanofluids. Barnali Mandal *et al* from Kolkata reported the Pediocin production by *Pediococcus acidilactici* in fed batch fermentation using meat processing waste. Jitanyu Chakrabarty *et al* from National Institute of Technology Durgapur, West Bengal, studied the frying and freezing effect on nutritional quality of major carps and potential contribution to human health from fatty acid signatures. Harish Kumar *et al* from Central University of Haryana, Srisra, Haryana, reported hexamine as anti-pit agent for mild steel in sulphuric acid medium.

## Special Issue on NCNE -2020 J. Indian Chem. Soc, July 2020

The special issue of JICS, July 2020 has published 39 original peer reviewed research articles out of 90 submitted manuscripts on the occasion of the National Conference on Nanotechnology & Environment (*NCNE 2020*) organised by National Institute of Technology Raipur, Chhattisgarh in association with the Indian Chemical Society, Kolkata. The Guest Editors of this special issue were Dr. V K Singh, Dr. Dharm Pal, and Dr. R Manivannan, National Institute of Technology Raipur, Chhattisgarh. This issue is available (open accessed) in the Society website [www.indianchemicalsociety.com](http://www.indianchemicalsociety.com)

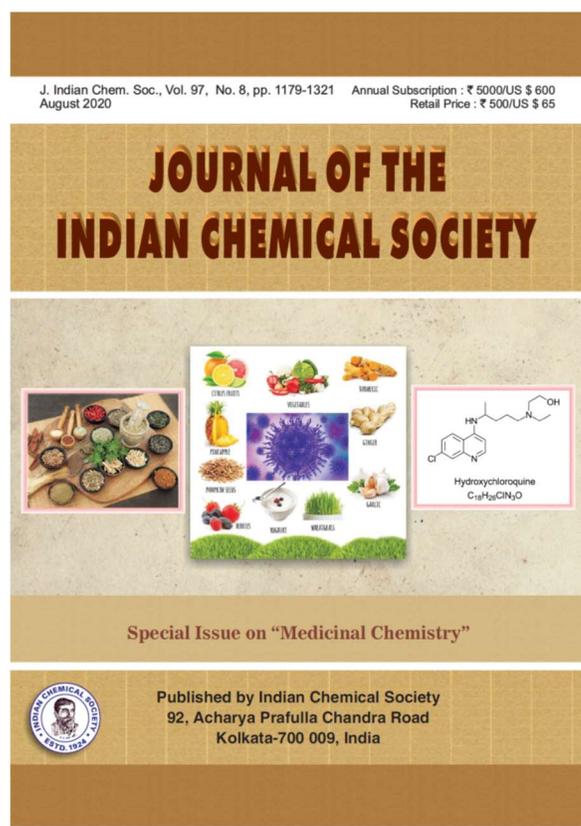


Recent trends in engineering and technology for successful research/scale-up look forward for building-up of the 'Atmanirbhar Bharat'. This Special Issue highlights the cost-effective method of nanoparticle and nanocomposite synthesis and discusses the remedy to combat the environmental pollution issues. The cutting-edge research on nanomaterials, nano(bio)technology and thin film deposition have also been discussed which includes the thermo-physical properties, toxicology, and environmental applications. The environmental and biotechnological perspectives of removal of hazardous waste were also discussed. In a nutshell this Special Issue of NCNE-2020 is a common and interdisciplinary viewpoint of chemical engineers, bio-engineers, and environmental engineers.

## Special Issue on Medicinal Chemistry J. Indian Chem. Soc., August 2020

The special issue, containing 17 articles (August, 2020) on a theme of Medicinal Chemistry is an attempt to focus the research endeavors towards new drug discovery and development. The Guest Editors of this special issue were Prof. Asit K. Chakraborti, Indian Institute of Technology Ropar, Ropar, Punjab; Prof. Debprasad Chattopadhyay, Director, ICMR-National Institute of Traditional Medicine, Belagavi, Karnataka; and Prof. Tapas K. Hazra, University of Texas Medical Branch, USA. All the peer reviewed articles published in this issue are available (open accessed) in the Society website [www.indianchemicalsociety.com](http://www.indianchemicalsociety.com)

Chemistry underpins everything that the advancement of modern science is associated with. It plays the pivotal role in the health care system and particularly in the realm of pharmaceutical sciences. In drug discovery and development, chemistry specifically organic synthesis holds the central stage. The advancement in chemical research is the key indicator of the economic growth and the societal development of any country. Chemical research has been one of the major strengths of our country that earned India the status of the pharmacy of the world. Acharya Prafulla Chandra Ray had been the doyen of chemical sciences in India showing



it the path and strength of entrepreneurship that laid the foundation of the pharma sector in the country.

We believe that under the scenario of COVID-19 pandemic and realising the necessity of development of therapeutics to cope up such unprecedented adverse impact on the healthcare system the decision of the Indian Chemical Society to dedicate a special issue of the Journal of Indian Chemical Society on Medicinal Chemistry is the most fitting gesture to reflect the act and concern of Acharya Prafulla Chandra Ray under such a need of the hour.

## *Honorary Fellows*

### HONORARY FELLOWS OF THE INDIAN CHEMICAL SOCIETY



Prof. Jean-Marie Lehn is a French chemist. He received the Nobel Prize in Chemistry together with Donald Cram and Charles Pedersen in 1987 for his synthesis of cryptands. Lehn was an early innovator in the field of supramolecular chemistry, i.e., the chemistry of host-guest molecular assemblies created by intermolecular interactions, and continues to innovate in this field.

[https://en.wikipedia.org/wiki/Jean-Marie\\_Lehn](https://en.wikipedia.org/wiki/Jean-Marie_Lehn)

<https://www.nobelprize.org/prizes/chemistry/1987/lehn/biographical/>

**Professor Jean-Marie Lehn. The Nobel Prize for Chemistry in 1987.**



Sir Richard John Roberts FRS is a British biochemist and molecular biologist. He was awarded the 1993 Nobel Prize in Physiology or Medicine with Phillip Allen Sharp for the discovery of introns in eukaryotic DNA and the mechanism of gene-splicing. He currently works at New England Biolabs, USA.

[https://en.wikipedia.org/wiki/Richard\\_J.\\_Roberts](https://en.wikipedia.org/wiki/Richard_J._Roberts)

<https://www.nobelprize.org/prizes/medicine/1993/roberts/biographical/>

**Sir Richard J. Roberts. The Nobel Prize in Physiology or Medicine 1993.**



Prof. Ryōji Noyori is a Japanese chemist. He won the Nobel Prize in Chemistry in 2001, Noyori shared a half of the prize with William S. Knowles for the study of chirally catalyzed hydrogenations; the second half of the prize went to K. Barry Sharpless for his study in chirally catalyzed oxidation reactions (Sharpless epoxidation).

[https://en.wikipedia.org/wiki/Ry%C5%8Dji\\_Noyori](https://en.wikipedia.org/wiki/Ry%C5%8Dji_Noyori)

<https://www.nobelprize.org/prizes/chemistry/2001/noyori/biographical/>

**Professor Ryōji Noyori. The Nobel Prize in Chemistry 2001.**



Prof. Robert Howard Grubbs, For Mem RS, is an American chemist and the Victor and Elizabeth Atkins Professor of Chemistry at the California Institute of Technology in Pasadena, California. He was a co-recipient of the 2005 Nobel Prize in Chemistry for his work on olefin metathesis.

[https://en.wikipedia.org/wiki/Robert\\_H.\\_Grubbs](https://en.wikipedia.org/wiki/Robert_H._Grubbs)

<https://www.nobelprize.org/prizes/chemistry/2005/grubbs/biographical/>

**Professor Robert H. Grubbs. The Nobel Prize in Chemistry 2005.**



Sir Venkatraman "Venki" Ramakrishnan is an Indian-born British-American structural biologist who is the current President of the Royal Society. In 2009, he shared the Nobel Prize in Chemistry with Thomas A. Steitz and Ada Yonath, " for studies of the structure and function of the ribosome". He was elected President of the Royal Society for a term of five years starting in 2015.

[https://en.wikipedia.org/wiki/Venki\\_Ramakrishnan](https://en.wikipedia.org/wiki/Venki_Ramakrishnan)

<https://www.nobelprize.org/prizes/chemistry/2009/ramakrishnan/biographical/>

**Sir Venki Ramakrishnan. The Nobel Prize in Chemistry 2015**



Professor Sir James Fraser Stoddart FRS FRSE FRSC is a British chemist who is Board of Trustees Professor of Chemistry and head of the Stoddart Mechanostereo chemistry Group in the Department of Chemistry at Northwestern University in the United States. He has developed highly efficient syntheses of mechanically-interlocked molecular architectures such as molecular Borromean rings, catenanes and rotaxanes utilising molecular recognition and molecular self-assembly processes. His group has even applied these structures in the fabrication of nanoelectronic devices and nanoelectromechanical systems. He shared the Nobel Prize in Chemistry together with Ben Feringa and Jean-Pierre Sauvage in 2016 for the design and synthesis of molecular machines.

[https://en.wikipedia.org/wiki/Fraser\\_Stoddart](https://en.wikipedia.org/wiki/Fraser_Stoddart)

<https://www.nobelprize.org/prizes/chemistry/2016/stoddart/biographical/>

**Professor Sir J. Fraser Stoddart. The Nobel Prize in Chemistry 2016**



Professor Man Mohan Sharma was appointed Professor of Chemical Engineering at the age of 27 in the Institute of Chemical Technology, Mumbai. He later went on to become the Director of UDCT, the first chemical engineering professor to do so from UDCT. In 1990, he became the first Indian engineer to be elected as a Fellow of Royal Society, UK. He was awarded the Padma Bhushan (1987) and the Padma Vibhushan (2001) by the President of India. He has also been awarded the Leverhulme Medal of the Royal Society, the S.S. Bhatnagar Prize in Engineering Sciences (1973), FICCI Award (1981), the Vishwakarma medal of the Indian National Science Academy (1985), G.M. Modi Award (1991), Meghnad Saha Medal (1994), and 8 honorary doctorates. He is Emeritus Professor of Eminence, Institute of Chemical Technology, Mumbai and Kothari Research Professor, Jawaharlal Nehru Centre for Advanced Scientific Research.

[https://en.wikipedia.org/wiki/Man\\_Mohan\\_Sharma](https://en.wikipedia.org/wiki/Man_Mohan_Sharma)

**Padma Vibhushan Professor M.M. Sharma**



Dr. R.A. Mashelkar is one of India's most eminent scientists. He served for over 11 years as the Director General of the Council of Scientific and Industrial Research and Secretary DSIR. He was the President of the Indian National Science Academy and the Institution of Chemical Engineers, UK. He is well-known for his contributions to both institutions, multiple 'Mashelkar Committees', a successful campaign against foreign patents on Indian traditional knowledge, and for his mantras of 'Inclusive Innovation', 'More from Less for More', and 'Gandhian Engineering'. He has been honoured by a plethora of awards, the most significant being the Padma Vibhushan, the Padma Bhushan, the Padma Shri, Business Week Star of Asia Award, and the Shanti Swarup Bhatnagar Prize for Science and Technology. He is the third Indian engineer to be inducted as a Fellow of the Royal Society, UK and the first Indian to be elected as a fellow of National Academy of Inventors, US. He served as President of the Global Research Alliance, which is the world's largest network of publicly funded R&D institutes. He is an ambassador and evangelist for innovation and R&D across the world and serves on the boards of many leading companies. He is a recipient of 43 honorary doctorates from leading institutes across the globe.

[https://en.wikipedia.org/wiki/Raghunath\\_Anant\\_Mashelkar](https://en.wikipedia.org/wiki/Raghunath_Anant_Mashelkar)

**Padma Vibhushan Dr. R.A. Mashelkar**



Professor K. Vijay Raghavan, FRS, is an emeritus professor and former director of the National Centre for Biological Sciences. On 26 March 2018 the Government of India appointed him as the principal scientific adviser. In 2012 he was elected a fellow of The Royal Society and in April 2014 he was elected as a foreign associate of the US National Academy of Sciences. He was conferred the Padmashri in 2013 and is also a recipient of the Infosys Prize in the life sciences category in 2009.

[https://en.wikipedia.org/wiki/K.\\_VijayRaghavan](https://en.wikipedia.org/wiki/K._VijayRaghavan)

**Padmashri Professor K. Vijay Raghavan**



Dr. Srikumar Banerjee is an Indian metallurgical engineer. He was the Chairman Atomic Energy Commission of India (AECI) and the Secretary of Department of Atomic Energy (DAE). Prior to his stint as DAE Chairman, he was the Director of Bhabha Atomic Research Centre (BARC). He is currently a DAE HomiBhabha Chair Professor at Bhabha Atomic Research Centre, Mumbai

[https://en.wikipedia.org/wiki/Srikumar\\_Banerjee](https://en.wikipedia.org/wiki/Srikumar_Banerjee)

**Padmashri Dr. S. Banerjee**



Professor Ashutosh Sharma is a Secretary to the Government of India since January 2015, heading the Department of Science and Technology (DST), where he helped initiate several new programs related to: infrastructure and human capacity building; innovation and startups; R&D in advanced manufacturing, waste processing, clean energy and cyber-physical systems; industry-academia cooperation; science communication; women scientists; and major international collaborations in the areas of priority for the nation. He is an Institute Chair Professor and C V Seshadri Chair Professor at the Department of chemical engineering of Indian Institute of Technology Kanpur and is on lien. He is a fellow of all national academies.

<https://dst.gov.in/ashutosh-sharma>

**Professor Ashutosh Sharma**



**Dr. Renu Swarup**

Dr.Renu Swarup is the Secretary, Government of India, heading the Department of Biotechnology (DBT), Ministry of Science and Technology. She has actively contributed in the formulation of India's Biotechnology Vision and Strategy. She is credited with the establishment of India's largest microbial resource centre, Microbial Culture Collection.

[https://en.wikipedia.org/wiki/Renu\\_Swarup](https://en.wikipedia.org/wiki/Renu_Swarup)



**Professor Collin Suckling, OBE**

Professor Colin Suckling has been Freeland Professor of Chemistry at the University of Strathclyde since 1989. During the 1990s until 2002, he served successively as Dean of the Faculty of Science, Deputy Principal, and Vice Principal of the University of Strathclyde. Much of Professor Suckling's work during that time was strategic including the development of inter-institutional and interdisciplinary research partnerships notably the research collaboration with the University of Glasgow (WestCHEM), which was recognized publicly with the award of OBE in 2006.

Professor Suckling's standing in the field of heterocyclic chemistry has been recognized by the award of the Adrien Albert Lectureship of the Royal Society of Chemistry (2009-10) and his appointment as chairman of the 2011 International Congress of Heterocyclic Chemistry to be held in Glasgow.

<https://www.strath.ac.uk/staff/sucklingcolinprof/>



**Professor Eric Jacobsen**

Professor Eric Jacobsen is the Sheldon Emory Professor of Organic Chemistry in Harvard University, and served as Chair of the Department of Chemistry and Chemical Biology from 2010 through 2015. He directs a research group of 20-25 graduate students and postdocs dedicated to discovering useful catalytic reactions, and to applying state-of-the art mechanistic and computational techniques to the analysis of those reactions. Several of the catalysts developed in his labs have found widespread application in industry and academia. These include metal-salen complexes for asymmetric epoxidation, conjugate additions, and hydrolytic kinetic resolution of epoxides; chromium-Schiff base complexes for a wide range of enantioselective pericyclic reactions; and organic hydrogen bond-donor catalysts for activation of neutral and cationic electrophiles. Jacobsen's mechanistic analyses of these systems have helped uncover general principles for catalyst design, including electronic tuning of selectivity, cooperative homo- and hetero-bimetallic catalysis, hydrogen-bond donor asymmetric catalysis, and anion binding catalysis.

<https://chemistry.harvard.edu/people/eric-jacobsen>

## HONORARY FELLOWS FROM INDUSTRY



Dr. Mukesh D. Ambani is a Chemical Engineer from the Institute of Chemical Technology (ICT), Mumbai (erstwhile UDCT, University of Mumbai). He pursued an MBA from Stanford University in the US. He initiated Reliance's backward integration journey – from textiles to polyester fibres and further onto petrochemicals and petroleum refining, and going upstream into oil and gas exploration and production. He created multiple new world-class manufacturing facilities involving diverse technologies that have raised Reliance's petrochemicals manufacturing capacities from less than a million tonnes to about 21 million tonnes/year. He has been bestowed Honorary Doctorate by ICT, Mumbai. He is a member of The Foundation Board of the World Economic Forum. He is an elected Foreign Member of the prestigious United States National Academy of Engineering. He is a member of the Global Advisory Council of Bank of America. He is also a member of International Advisory Council of The Brookings Institution.

<https://www.ril.com/OurCompany/Leadership/Mukesh-Ambani-Chairman-and-Managing-Director.aspx>

**Dr. Mukesh D. Ambani**



Shri Rajjubhai D. Shroff is the Chairman of United Phosphorus Limited (which is now UPL Ltd) which was started in 1969 as a small-scale unit at Vapi, Gujrat, for the manufacture of red phosphorus for the first time in India. The business growth of the company is supported by subsidiaries, strategically located, and spread across all continents. UPL has its own subsidiary offices in Argentina, Bangladesh, Brazil, China, Canada, Denmark, Hong Kong, Indonesia, Japan, Korea, Mauritius, Mexico, New Zealand, Russia, Taiwan, South Africa, USA, UK, Vietnam & Zambia. Popularly hailed as India's 'Crop Protection King', he believes in doing things differently to achieve great results. UPL is focused on emerging as a premier global provider of total crop solutions designed to secure the world's long-term food supply. His many awards are a mere testimony of his legend. Some of them are: AGROW Lifetime Achievement Award in September, 2015 in London, UPL listed by the World CSR Congress as one of the top '50 Most Caring Companies Award 2014; Ernst & Young Entrepreneur of the Year Award (manufacturing) in 2013. Rolta Corporate Award 2010; Indian Chemical Council's Lifetime Achievement Award for the entrepreneur in 2010. Lifetime Achievement Award by Chemexil in 2008; President's Gold Shield Award for indigenous development of technology in 1972.

<https://www.upl-ltd.com/rajjushroff>

**Shri. Rajjubhai D. Shroff**

*57<sup>th</sup> Annual Convention of Chemists 2020 (ACC-2020) & International Conference on Recent Trends in Chemical Sciences - 2020 (RTCS-2020)*

The 57<sup>th</sup> Annual Convention of Chemists 2020, the yearly event of the Indian Chemical Society, had been organized on December 26–29. The programme was inaugurated by Nobel Laureate Prof. R. Noyori, Japan. In view of the present COVID pandemic situation in our country, the Convention was conducted in virtual mode. In the inaugural day of the Convention (2020), following the felicitation of eminent personalities with the Lifetime Achievement Awards of the Indian Chemical Society in recognition of their lifetime achievements in teaching and research in the field of Chemistry.

**Presidential Address**  
**In The 57<sup>th</sup> Annual Convention of Chemists**  
**(ACC-2020)**

Dear Friends,

At the very outset being the President (Prof. Yadav) of the Chemical Society welcomed everybody present at the Annual Chemist Convention. I am happy to inform you that during this pandemic period the Society has engaged in different academic activities. One of the most important things which is going to change the face of the Society is the publication of the Journal of Indian Chemical Society which will be published by famous publisher Elsevier from 2021.



Some new guidelines of fellowship have been defined. Step has been taken to create a new category of life membership as every member cannot be a fellow of this Society. Besides life fellow there is another category of membership, i.e. life membership of the Society. Student memberships are there for graduate students, post graduates and Ph.D. students with onetime fee of Rs. 500/-. Institutional membership and Corporate Membership also have been created this time. I appeal to all colleagues to take initiative for making Institutional or Corporate Membership to help the Society.

Chemical Society has started an online bulletin since last February, 2020 where Dr. Nibedita Chakrabarti and Dr. Gourisankar Roy Mahapatra are the editors and now our Hon. Secretary will join to lead the team as an Editor-in-Chief. We celebrated Acharya P.C. Ray's birth centenary on 2<sup>nd</sup> and 3<sup>rd</sup> August. It was a great programme. I request you all and the Branches to initiate online webinars on every Saturday. We are doing collaboration with ACS and RSC and they have participated in this



particular convention.

There is nothing in this world which does not use chemicals. Everything is prepared using chemicals. So chemical industries are the central part of our life and nation at large. So, chemistry is increasingly shifting from structure, function and chemists need to develop better strategies to efficiently generate molecules and systems of molecules with desired properties, be that physical, chemical or biological. These are required to meet the needs of our society.

New logo of cover of the Journal of Indian Chemical Society will be unveiled in January, 2021. In the first time of the History of the Chemical Society the President becomes the Editor-in-Chief as desired by Elsevier and the Journal becomes the great source of knowledge. Subscription of this Journal is USD 10\$ (Rs. 800/-) for one year and Rs. 3000/- for five years.

Great news is there for the members of the Chemical Society regarding Honorary Fellows of the Society. Prof. Jean-Marie Lehn, a Noble Prize Winner in Chemistry in 1987 who is going to be the Valedictory Speaker of Annual Chemists Convention is the first Honorary Fellow of the Society. Sir Richard J. Roberts the Nobel Prize winner in physiology or medicine, 1993, sent a message. “Dear Participants, I am happy to welcome you to the Annual Convention of the Indian Chemical Society, albeit only virtually. I am really sorry not to be present in person. 2020 has been a very difficult year and one that I know many of us will want to forget. I feel optimistic that 2021 will be a significant improvement and there will soon be light at the end of the tunnel with vaccines being available throughout the world. I am especially happy to address a conference of chemists as I myself started life as an organic chemist before switching to molecular biology. Chemistry is a wonderful pursuit and provides training that can be useful across many disciplines. I wish you all every success in your careers and would encourage you all to follow your passion when deciding what to study. For me, my job is my hobby and there is no greater satisfaction than endlessly pursuing your hobby. Happiness comes from how you spend your days not your money. So, thank you very much Sir Richard.”

Professor Royji Noyori, Nobel Prize winner in Chemistry in 2001 is going to address and Professor Noyori was the first to accept the honorary fellowship of the Indian Chemical Society. Professor Robert H. Grubbs, the Nobel Prize winner in Chemistry in 2005 accepted the honorary fellowship of Indian Chemical Society. He is an American Chemist and Victor and Elizabeth Atkins Professor of Chemistry at CALTech. He received the Nobel Prize in Chemistry for olefin metathesis. Sir Venkat Ramakrishnan, the Nobel Laureate also became pleased and honoured to be elected as an Honorary Fellow of the Indian Chemical Society. Professor Sir J. Fraser Stoddart, the Nobel Prize winner in Chemistry in 2016 wrote “ I am humbled and honored to have been selected as an Honorary Fellow



of the Indian Chemical Society. It is an honor that I would like to share with the many talented graduate students and postdoctoral fellows I have had the immense pleasure to mentor and conduct research alongside in many different fields of chemistry during my 50 years in academic life. I have also been privileged to have excellent and warm relationship with many senior Indian chemists during the past half century. I thank all of them for the trust they have put in me and for their support over the years. I wish the Indian Chemical Society all success as it takes its mission and vision forward in to the third decade of 21<sup>st</sup> century. Thank you for embracing me as one of your Honorary Fellows as your set out on this next stage of your journey.” ...thank you, Sir, thank you very much.

And of course, Padma Bibhushan Professor M.M. Sharma, former director of ICTE and UDCTE, past president of INSA, a fellow of Royal Society of London is the only second engineer who has been elected from India joined as Honorary Fellow of our Society. He wrote “I am delighted to be associated with the Indian Chemical Society for a long time. We cannot live without chemistry which has made our lives healthier, happier and rewarding. Chemistry has solutions to various problems we face and strong links with biology and material science further makes us an enabler.”

Padma Bibhushan Dr. R.A. Mashelkar, former Director General of CSIR and a Fellow of Royal Society has accepted our honorary fellowship. Padmashri Dr. S Banerjee, the former Chairman of Atomic Energy Commission has accepted the honorary fellowship of our society. We are glad that he has joined the conference. Padmashri Prof. K. Vijay Raghavan, Fellow of Royal Society, another chemical engineer, who became biologist, is the principal scientific advisor of Govt. of India also became the Honorary Fellow. And of course, Professor Ashutosh Sharma, Secretary of DST, who is a Professor of Chemical Engineering of IIT, Kanpur wrote “I was delighted to accept the Honorary Fellowship of the Indian Chemical Society, the premier professional society of the country which was established by the great Acharya P.C. Ray. We remembered him again this year as the founder academic, industrialist who started the Bengal Chemicals and Pharmaceutical Works Limited which manufactures hydroxychloroquine. The message of chemical science is very simple: be creative, produce quality knowledge with relevance in the service of society at large.

The society has come a long way since 1924 having on its scroll many illustrious scientists and Noble Laureates as Honorary Fellows. DST and Indian Chemical Society have very long history of association. I am given to understand that there is a nominee of the DST on the Council of Society. DST is also supporting the construction of Indian Chemical Society building in Kolkata. I am happy to learn that the Annual Convention of the Society is scheduled from December 26, 2020 which will be inaugurated by Nobel Laureate Professor Ryoji Noyori, with the valedictory function being



addressed by Nobel Laureate Professor Jean-Marie Lehn. My greetings to all participants and wish the convention a great success to inspire and empower the participants, especially the younger minds.”

Then of course Dr. Renu Swarup, Secretary of DBT, has also accepted our Honorary Fellowship. Dr. Mukesh Ambani, CMD, Reliance Industries Ltd, who is a Chemical Engineer, is delighted to accept the honorary fellowship of our society. One more billionaire industrialist, Shri. Rajjubhai Shroff, who is the Chairman of UPL Ltd, has also accepted and told me that he will support our activities. With these great people the Society can go a long way. Those who are in academia may nominate the best of the persons to be the fellows of the Society and also may participate to open new Chapters.

Society’s own building will be constructed with the help of the Industries. Our Journal of the Indian Chemical Society will be published by the Elsevier and will be inaugurated in January, 2021. The first issue has 35 articles and the processing has been started. Journal is now a part of Science direct and Elsevier has promised that this will be their Journal. So, Indian Chemical Society is leading to the next decade of century. Everybody should participate in activities. Scientists-in-Charge, the conveners and the co-conveners have done a fantastic job in collecting, assimilating and assembling many good Scientist across the world, so that this becomes a memorable convention.

Pandemic gave us a new opportunity to communicate virtually and this is the way of new life and how we have accepted it but our spirit is not less, and as one amongst you I am elated to be selected as President of the Indian Chemical Society. So, I thank all of you putting me in it and I hope to live upto your expectations not only as President but also as the Editor-in-Chief of the Journal of the Indian Chemical Society. With these few words I want to welcome all of you. Thank you very much.

Yours sincerely,

G.D. Yadav

### **Professor Padmanabhan Balaram, IISc., Bangalore**

Early research of Professor P Balaram focussed on the membrane active peptide alamethicin, leading to a career long interest in the conformational restrictions on backbone folding promoted by the unusual residue alpha aminoisobutyric acid (Aib). The facile formation of 3<sub>10</sub>-helical structures in Aib peptides was established by his studies in the late 1970s. His researches on the use of conformational constraints to direct peptide backbone



folding led to the structural characterization of designed synthetic sequences that mimic secondary structures found in proteins. The use of D-Pro residues in nucleating beta hairpin formation, the design of multistranded sheets and the use of beta and gamma amino acid residues in generating hybrid helices were reported from his laboratory in the 1990s. His laboratory was among the first to structurally characterise beta and gamma amino acid containing peptide structures in the 1990s, a key step in the development of the area of foldamers. His laboratory was also one of the first in India to apply the techniques of biological mass spectrometry in the area of protein chemistry.

The laboratory of Professor Balaram has contributed extensively to studies of the enzyme triosephosphate isomerase from plasmodium falciparum and more recently in the mass spectrometric and transcriptome based characterisation of peptide libraries from marine cone snail venom.

### **Professor Debashis Mukherjee, IACS, Kolkata**

Professor Mukherjee is a world leader in Theoretical Chemistry, well-known for his pioneering contributions in the field of molecular electronic structure and theoretical precision spectroscopy for electroweak interactions. His formulations of multi-reference coupled cluster formulations are regarded as pioneering and ground-breaking and are now standard works in the field. They are named after him.

His cluster cumulant theories at finite temperature -- the corresponding Many Body Formalisms in Statistical Mechanics are also widely known and are increasingly being used in a wide variety of Statistical Mechanics problems.



The inaugural session was presided over by Professor G D Yadav (Padmashri), President, Indian Chemical Society.

## Glimpses of the program on 26<sup>th</sup> December, 2020

### Synopsis of the talk of Prof. R. Noyori:

The time has been rapidly changing. Now, science is inevitably interconnected with the society as declared at the World Conference on Science in Budapest in 1999, already 21 years ago. Furthermore, world is now fast forwarding to ICT network age, thus slipping away the constraints of time and distance. Science and technology are meant to enrich lives contributed to security and peaceful sovereignty of every nation and sustain human civilization. Any innovation based on science and technology are truly directed in a way to provide all necessary goods and high quality services to all kind of people regardless of age, gender, religion or language, thereby securing various comfortable and safe life as well for everyone. Chemistry goes beyond mere observation and understanding of nature and is capable of generating very high value from almost nothing. In fact, manmade substances and materials determine the quality of human life. Today scientific research is to be more interdisciplinary, trans disciplinary or even anti disciplinary. In practical, chemistry must maximize its potential in this way. Chroma chemist point of view all scientific disciplines are founded all materials or substances interconnected by mathematics and information. Therefore, chemistry should aim at growing to a real central science by interacting with all kinds of surrounding research fields. Without doubt, mathematics and ICTE as origin of India's intellectual competitiveness and very much certain that India will be playing the key role in further enhancing the capability of chemical science. The Physicist Schrodinger, who was asked in 1944, "what is life?" and later Jim Watson correctly stated, "life is simply a matter of chemistry". In fact, in this century, many recent Nobel Prizes in Chemistry have been awarded for innovative achievement in the interface between Chemistry and Biology.

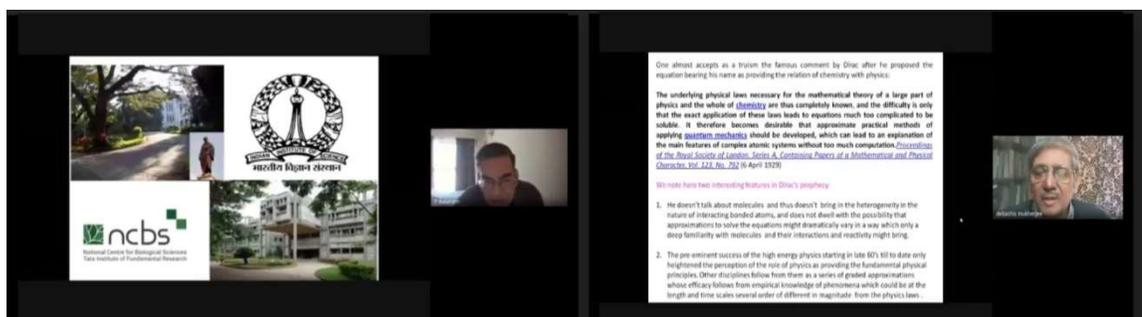
Moreover, any unique physical property and function emerged from well-organized chemical composites of selected elements. In this regard, younger generation is required to radically change their mindset through exposure to other scientific disciplines and advanced technologies, thereby exploring new possibilities.

With regard to chemistry based technologies, the benefits to mankind are crystal clear. Contributions include among others, securing adequate fuel sources, increasing life expectancy from 45 to 80 years, in just one century, improving quality of life and high speed communication. Without endeavour of chemical industries today's civilised society, cannot sunrise.

However, a bright light also catches a dark shadow. Chemical Industry sometimes gets out of control. Looking back at the twentieth century, there are relatively a number of events, those define the good name of our science of chemistry. To site just a few examples, acid rain from the use of fossil fuels, disruption of biosphere by DDT, depletion of ozone layer due to hydrocarbons use, global warming from excessive greenhouse gas emissions and the use of chemical weapons which is totally unacceptable. A more recent problem is serious ocean pollution caused by the huge volume upto 10 million tons annually of plastic waste. For too long, chemical industry has been controlled by the external events changing only after the circumstances dictated it. To maintain the quality of civilization, all stakeholders including particularly consumers must take responsibility and implement appropriate action. High level of material civilization has been achieved through human intellects. But, humankind must reflect deeply in the fact that excessive personal appetite has caused irreparable environmental disruption. In many cases, attempts to scientifically verify these kinds of negative effects have been hindered by major political and economic pressures as well as by the external conflicts between public regulation policies and free market principles.

Uncontrolled and excessive human activities in this unstoppable way, triggering drastic climate fluctuation and environmental changes depleting resources and energy, warning economic disparities and leading our human society to a crisis situation. Political inaction is a betrayal of today's young people and all the generations to come. Meanwhile, at its general assembly in 2015, United States of Nation passed a resolution called the "2013 Agenda" for 17 sustainable development goals SDGS. The slogan is "no one should be left behind". Achievement of many of these targets rely on the advancement of science and technologies. Chemists are expected to devise new solutions to meet the needs of all social segments with regard to materials and energy. Research on green chemistry, sunlight harvesting, and drug discovery should be pursued among others. The cutting edge technology of chemical synthesis allows production of such important pharmaceutical drugs as anti-cancer, anti-age, anti-ulcer and anti-bacterial agents. But now facing the terrible Covid 19 pandemic situation globally, the society is waiting for the chemical invention of potent medicines to combat with this eminent fear. Carry Maris in 1993 Noble Laureate in Chemistry invented the PCR Technology crucial for the detection of Corona virus infection. Obviously the pursuit of Chemistry and chemical technology alone is not enough to transform the society. However, researchers must have to drive public opinion and governmental policies for enhancing public welfare and constructing a sustainable society. Society demands this from chemists.

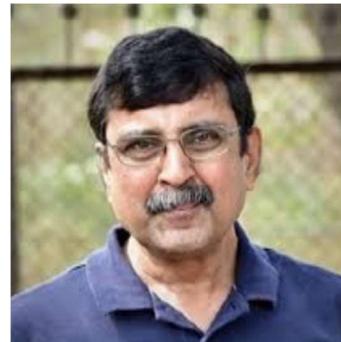
Whereas in recent years, major innovations in science and technology, businesses and social systems are seen. Today, however ethical, legal and social issues have not been functioning as they should. Everybody should rethink about the meaning of science and technology including chemistry. The twentieth century was an era of international competition symbolised by economic rivalry and war. In this century however, global cooperation and collaboration is needed for the survival of our species within the limits of this planet. Indian Chemical Society with a glorious tradition will come out as a variant institution to brighten the society at large by taking strong worldwide leadership towards this direction.



The Program of 57<sup>th</sup> Annual Convention of Chemists 2020 & International Conference on Recent Trends in Chemical Sciences included following 14 Endowment Lectures

**Acharya J. C. Ghosh Memorial Award :**

Prof. Anunaya Samanta, University of Hyderabad



**Professor J. N. Mukherjee Memorial Award :**

Prof. Ashok K Ganguli, IIT Delhi



**Professor P K Bose Memorial Award:**

Prof. Asit K Chakraborti, IIT Ropar



**Professor Dhananjay Nasipuri Memorial Lecture:**

Prof. Alakananda Hajra, Visva Bharati



**Professor A. S. R. Anjaneyulu 60th  
Birth Day Commemoration Award:**

Prof. Ramaswamy Murugavel, IIT  
Bombay



**Professor Suresh C. Ameta Award :**

Prof. Kalidas Sen, University of  
Hyderabad



**Professor R. D. Desai 80<sup>th</sup> Birthday  
Commemoration Award:**

Prof. Biprajit Sarkar, Stuttgart



**Professor R. S. Varma Memorial  
Award :**

Prof. S P Rath, IIT Kanpur



**Professor A K Chandra Memorial Award:**

Prof. Sourav Pal, IISER Kolkata



**Dr. Basudev Banerjee Memorial Medal and Prize:**

Prof. Francis Verpoort, Wuhan



**Rev. Fr. L. M. Yeddanapally Memorial Award:**

Prof. Ashwini Nangia, Director, NCL  
Pune



**Professor S. S. Sandhu Award:**

Prof. Vivek Polshettiwar, TIFR,  
Mumbai



**Professor G. V. Bakore Memorial  
Award:**

Prof. J J Vittal, Singapore



**Dr. Ghanshyam Srivastava Memorial  
Award:**

Prof. Govindasamy Mugesh, IISc.,  
Bangalore



The program also included several Invited Lectures delivered by eminent scientists and academicians across the world. There were provisions for presentation of contributory papers, posters by the researchers from different Research Institutes and Universities and Colleges throughout the country and abroad. The Indian Chemical Society intended particularly to encourage the budding young chemists of our country and abroad by organizing special award sessions to accommodate the contributions of the young chemists also. The Convention provided an effective platform for exchange of thoughts among the participating chemists to generate new ideas and open up new fields of research. This is for the first time, the selected S. S. Bhatnagar Young Scientist Awardees and Indian Chemical Society Research Excellence Awardees of August 2020 International Symposium had also been invited to present their research in the wider audience in the Annual Convention of Chemists 2020. About 400 participants in seven different scientific sessions from all over the country and abroad participated in the event.

**Reports from seven different sectional Scientists-in-charge and Conveners are furnished below:**

### Physical Chemistry Section

Almost all the important front line research areas of Physical Chemistry particularly The Statistical Complexity and application in electronic structure of atoms and molecules, Recent developments in utilizing semiconductor quantum dots in light energy conversion, Cellular and Biomedical applications of Nanozymes and nanoisozymes, Surface Enhanced Raman Scattering and its important applications, Biophysical Chemistry and Allosteric Regulation of Molecular Tunnels, Luminescent metal nanoclusters and applications, Extraction of essential oils from Peels of Pomelo Fruit, Supramolecular Chemistry and molecular properties of macrocyclic host-assisted functional assemblies, Surface Chemistry and solubilization of drugs in mixed micelles, Molecular Design Strategies for Singlet Fission, Electrocatalysis, Water Splitting, Chemistry beyond the conventional wisdom, Broad-band Excitation and Broad-band Emission', Spin Frustration and Topology, etc. have been covered.

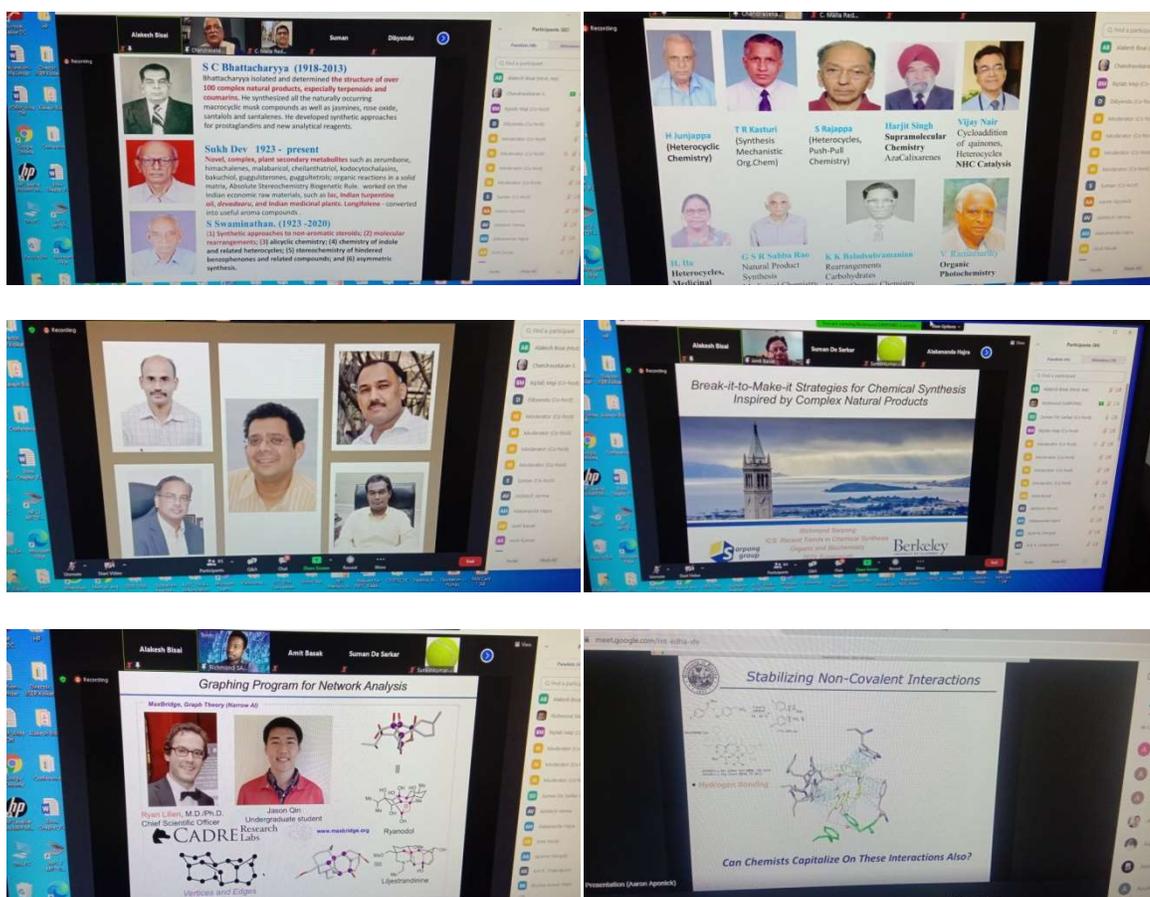


## Organic & Biochemistry Section

57<sup>th</sup> Annual Convention of Chemists for Organic & Bio-Chemistry Section of the ICS entitled Recent Trends in Chemical Sciences (RTCS), Organic & Bio-Chemistry (OBC) section, was held at IISER Kolkata.

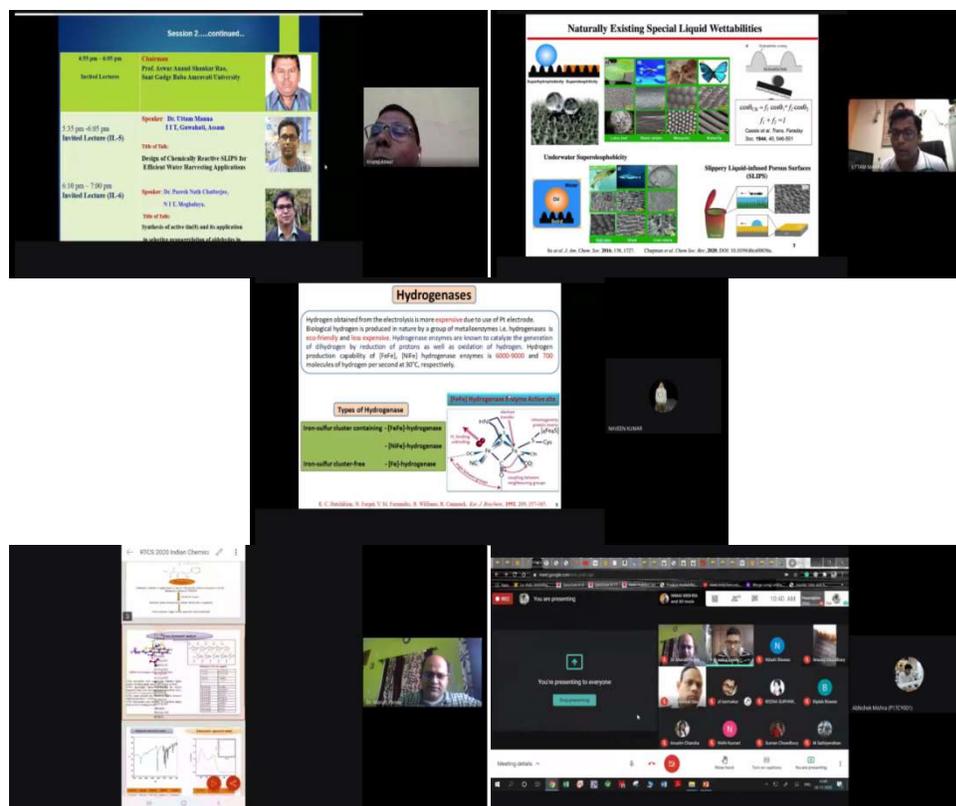
The technical session of this symposium was started with a **Key Note Lecture** by **Prof. S. Chandrasekaran**, INSA Distinguished Professor, IISc Bangalore who talked about the Past, Present, and Future of Organic Chemistry in the Nation.

There were several Journal Awards for the oral and poster presentations sponsored by the American Chemical Society, Royal Society of Chemistry, and IISER Kolkata.



## Inorganic Chemistry Section

In the “Inorganic Chemistry Section” three award lectures were delivered by Prof. Ramaswamy Murugavel of IIT Bombay, Prof. Biprajit Sarkar of University of Stuttgart, Germany and Prof. Sankar Prasad Rath of IIT Kanpur. Quite interestingly each dealt with completely different aspects of the diverse area of modern inorganic chemistry. Of the 12 invited lectures in this session there was an emphasis on the part of the organizing committee to ask young faculty members and those in the middle of their academic career to make presentations keeping in mind different regions of the country were duly represented. There were three invited lectures by very senior and internationally recognized foreign faculty members, Prof. Joe Otsuki of Nihon University, Japan; Prof. Debbie Crans of Colorado State University, Fort Collins, USA and Prof. Nils Metzler-Nolte of Ruhr University Bochum, Germany. Each of them so nicely explained how coordination chemistry can be used for the benefit of mankind either to explain natural processes like photosynthesis or use it in different medicinal applications or in biomedical applications of metal-peptide bioconjugates, clearly mentioning as well what is being done by people in different parts of the world. As far as academics is concerned diverse aspects of modern research related to “Inorganic Chemistry” was discussed.



## Analytical Chemistry Section

The Analytical Chemistry Section started with an Endowment lecture by Prof. Vivek Polshettiwar on fuel conversion from CO<sub>2</sub> using nanosilica. Development of environmental friendly routes to fabricate composite materials with controlled size and morphology for effective eradication of water contaminants and energy storage was taken up by Prof Ashok Sharma. Different aspects of silica in the environment were discussed by Dr. Archana Painuly. Different analytical instrumentation and their application in research and industrial fields were discussed Dr. Ajit Datar and Dr. Shinjan Choudhary. Multifunctional materials like nanocomposites were handled by Prof



Position and width of shape resonance for e<sup>-</sup>F<sub>2</sub> at various bond lengths using CAP-FSMRCCSD method:

Bond length (a.u.)	Energy (eV)	Width (eV)	Energy (eV)	Width (eV)
Method	CAP-FMRCSD <sup>a</sup>		CAP-FSMRCCSD	
2.47	1.726	0.021	1.178	0.147
2.57	0.576	0.0029	0.582	0.082
2.62	—	—	0.220	0.060
2.64	—	—	0.065	0.048

<sup>a</sup> M. Tamura, J. Hasekawa, J. Chem. Phys. 127, 154119 (2007)

A. K. Srivastava. Drug-target interactions were discussed at length by Dr. Neelima Gupta. The vastly growing field of ionic liquids opened new dimensions for the audience of Analytical Chemistry section as the discussions of Prof. Gardas and Dr. Mohapatra unveiled the intricacies of salvation of this class of solvents and their use in fuel cycle of nuclear reactors. The discussions also covered several aspects of colloidal materials like magnetically tunable colloids, and their characteristics by

Prof. Biswal and Dr. Hassan. Discussion on fluorescent probes used in several sophisticated analytical techniques was taken up by Prof A. K. Singh. The overlap of analytical chemistry with environmental, biological and archaeological sciences was discussed by Prof. Susanta Lahiri. The neutron activation methods of analysis were discussed in detail by Prof A. Chatt. The finest and the most sophisticated art of nuclear analysis was dealt with the newly synthesized super heavy elements and their characterization for placing them in the right position of the periodic table was nicely discussed by Professor T. K. Sato. The topics of discussion in the Analytical Chemistry section covered a vast field and present a vivid picture of the current scenario of research in this area.

### Industrial & Applied Chemistry Section

In the Endowment Lecture in Session-1, **Prof. Ashwini K. Nangia**, University of Hyderabad and former Director, NCL Pune highlighted the importance of Crystal Engineering of Solid-state Pharmaceuticals and X- ray crystallography in the development of new and improved medicines in pharmaceutical research.

**Dr. Wen Hua Sun** in his presentation on Novel Practicing Catalysts for Outstanding Polyethylenes, highlighted the use of Iron & Cobalt based catalysts for synthesis of new types of polyolefins displaying unique properties and microstructures. **Prof Ramanan** from IIT Delhi, in his talk on Metal Organic Framework, highlighted the key challenges in storing hydrogen and possible solutions to increase the uptake of hydrogen at room temperature by understanding the mechanism of hydrogen adsorption and designing suitable MOF.

**Dr. Samik Hait** from IndianOil-R&D highlighted various initiatives by Indian Oil for development & commercialization of new nano-materials and their applications in the energy sector. **Dr. Shubhangi Umbarkar** from NCL Pune discussed use of new hi-tech materials like metal fluorides for various applications including catalysis, role of metal-support interaction and use of palladium based nanoparticles supported on metal fluoride for various organic transformations including hydrogenation of organic molecules which finds application in various industries like pharma, agro, perfume etc.

**Dr. Ramkumar Dhruva** from BASF, in his presentation on Sustainable Chemistry – Growth driver of tomorrow, touched upon few selected solutions and technological innovations that help to keep the materials through reuse, resource, recovery and recycling technologies and use of alternative and sustainable feedstock as a building block for tomorrow's value chain. **Prof. Sudip Kumar Das** from

University of Calcutta discussed the issue of water pollution due to heavy metals and dyes across the globe especially in developing countries including India and use of cellulose materials for the removal of heavy metal and dyes.

**Dr. Gautam Yadav**, Urban electric Power, USA highlighted the use of energy dense aqueous based Manganese Dioxide/Zinc battery to challenge Lithium- Ion's dominance in the industry. **Dr. Sean Simpson, Lanza Tech, USA** discussed the commercially available Gas fermentation process that allows continuous production of fuels and chemicals from gases under Carbon recycling.

**Prof. Steven Holdcroft** from Simon Fraser University, Canada discussed the progress & challenges in the development of robust, fluorine-free, proton- and hydroxide-conducting membranes for the hydrogen economy starting from its discovery to commercialization. **Dr Amitava Pramanik, IISc, Bangalore**, pointed out that most of the Chemistry departments of reputed Indian Universities and research centres are unaware of the needs of Indian Chemical Industries and need of effective Academic and Industry interaction for the prosperity of the nation in all aspects.

**Dr. Nikhil K. Singha**, IIT, Kharagpur emphasized the importance of click reactions for synthesis of varieties of functional materials and polymers for different applications along with its advantages like mild reaction condition, high yield and stereoselectivity.

**Mr. David Claydon**, Afton Chemicals, UK highlighted the role of fuel additives including multifunctional additive during last ten decades for better quality fuel meeting fuel specifications, OEM requirements with improved performance and stringent environmental regulations in a cost effective way. **Dr. Swapan Kumar Ghosh**, Nova Surface-Care Centre Pvt. Ltd., Mumbai in his talk described the development of NANOVA HYGIENE which can be used as an antimicrobial coating having low surface energy on surfaces like fabric, metal, plastics concrete etc. and a potential candidate to address the spreading of COVID-19 through surface touch

**Dr M Sau**, R&D Division, Indian Oil Corporation R&D Division discussed the importance of crude oil to chemical process considering demand on chemical / petrochemical and emerging scenario. And last, but not the least, **Dr. Shelly Kelly**, Honeywell UOP, USA highlighted importance of Advanced Characterization tools to understand the complex nature of Industrial Catalysts using various critical, sophisticated analytical techniques with special emphasis on X ray absorption spectrometry which can probe the active sites and measure the environment of active metal sites.



**Nanotechnology for Downstream Petroleum Sector: Lab to Market Transition**

57th Annual Convention of Chemists

**Dr. S. K. Hait**  
Indian Oil Corporation



**Hydrogenation**

Pharmaceutical Industry  
Petrochemical Industry  
Agriculture Industry  
Food Industry  
Dyes Industry



**Global trends provide opportunities for growth in the chemical industry**

- Advanced markets**
  - Differentiated consumer needs
  - Aging populations
  - Focus on sustainability
- Growth industries**
  - Nutrition
  - Beauty and care
  - Additives
  - Digitalization
  - Electromobility
  - Materials and surface optimization
  - Chemicals
- Emerging markets**
  - Population growth
  - Rising incomes
  - Expanding middle class
- Sustainability**
- Co-creation**
- Digitalization**
- New Business Models**
- People**

**BASF**

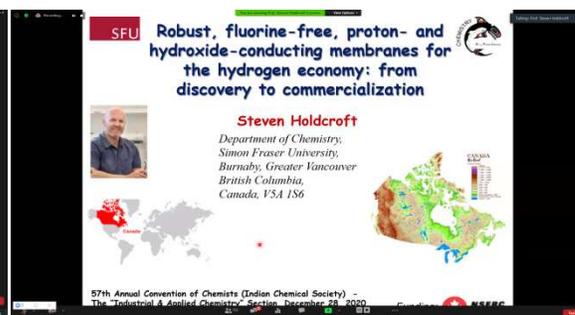


**Sustainable chemistry: Growth driver of Tomorrow**

- Chemistry will continue to play a key role
- Make sustainability the core of everything we do
- Innovation is key to success.
- Success can be achieved only if industry, academia & regulators work closely.

**BASF**





**SFU** **Robust, fluorine-free, proton- and hydroxide-conducting membranes for the hydrogen economy: from discovery to commercialization**

**Steven Holdcroft**  
Department of Chemistry,  
Simon Fraser University,  
Burnaby, Greater Vancouver  
British Columbia,  
Canada, V5A 1S6

57th Annual Convention of Chemists (Indian Chemical Society) - The Industrial & Applied Chemistry Section, December 28, 2020

### Environmental Chemistry Section

There were following 7 plenary lectures by eminent academicians and industrialists focused on

1. Messed up our ecosystems and the major problems human life is facing
2. Sustainable Energy, Climate Change and Hydrogen Economy How to achieve goals through Changes in Policy and Practices
3. Use of Low-Emission Alternative Fuels for Sustainable Transport
4. Greener approach for the recovery of industrial waste HCl and H<sub>2</sub>S
5. Bioremediation of Oil Sands Process-Affected Water
6. New trends and technology towards Water Disinfection and sustainable wastewater treatment technology
7. Fire Protection system and automation in industries.

Following topics were covered in 11 invited lectures

1. Green hydrogen generation and geothermal energy production by ONGC Energy Centre
2. Combined SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub> removal from simulated thermal power plant stack gases
3. Biomimetic Studies to Detoxify Neurotoxic Organomercurials
4. Modified membranes for selective ion separation and oil-water purification
5. Tannery Waste Treatment
6. Chemosensors, biosensors and miniaturization towards portable devices
7. Room temperature toxic gas sensors for environmental monitoring and “Lab-on-Chip”
8. Efficient conversion of CO<sub>2</sub> to value added Chemicals
9. Coal fly ash: A metallurgical resource
10. Waste Recycling for Metals and Materials – from different end of life cycle Batteries.
11. Recycling of Plastic Waste Using Modern Available Technologies for Making Sustainable Society

Following topics were covered in 27 oral lectures and 5 poster presentations

1. H<sub>2</sub>S valorisation through production of H<sub>2</sub>
2. Carbon dioxide adsorption and its chemical fixation
3. Flexible paper-based electrodes towards electrochemical biosensing application

4. H<sub>2</sub>S” from environment pollutant to new form of energy
5. Environment benign Approaches for organic synthesis and valorisation of industrial waste products, degradation of organic dyes, textile dyes, Biodiesel production.
6. Impact of pesticides in plant.
7. Bacterial Biofilms Based Bioaccumulation of Lead and Conversion of Chromium.

## Chemical Engineering & Green Technology Section

In the first session, Dr R.V. Jasra, Prof. Chandramouli Subramaniam, and Prof. P. Selvam has delivered the presentation on Catalysis in Green Chemistry and advanced catalyst application in a diverse area. In the second session, Dr. K Vijaya Mohanan Pillai delivered the talk on recycling and recovery of the lithium battery and Indian perspective for same. Dr. S. Kannan and Dr. KulamaniParinda delivered the lecture on a bio-based material with tremendous opportunity and explained with recent case studies. Dr. Prasad Bhagavatula was given an expert talk on the preparation of 2D metal thiolates as single-source precursors, which also provided more understanding of solventless preparation of semiconducting metal and bimetallic sulphide nanocrystals. Dr. K.K. Pant presented on topic catalytic conversion of CO<sub>2</sub> containing syngas to methanol and dimethyl ether. The third session provided more understanding for the utilization of renewable resources in catalysis. In the last session, the presentations also provide the view of fundamental and applied understanding details on the catalyst designing and process optimization in valorization. Dr. Anil Verma delivered the talk on E-mobility: energy storage platform for EV charging. Dr. A. K. Sinha discussed the recent advances and trends in bio-jet and JP-10 fuels in India. Dr. Manorama delivered a talk on a synthesis of functional nanomaterials and their application in energy, environment as well as biology.

**57<sup>th</sup> Annual Convention of Chemists, 2020 & International Conference on Recent Trends in Chemical Sciences RTCS-CEGS 2020**  
**Chemical Engineering & Green Chemistry Section**  
 The Conference Will Start at 10 am

**Scientist-in-charge: Prof. V. K. Rathod**  
 Professor, Department of Chemical Engineering,  
 Institute of Chemical Technology, Mumbai

**Convener: Prof. B.M. Bhanage**  
 Professor, Department of Chemistry,  
 Institute of Chemical Technology, Mumbai

**Convener: Prof. Avijit Ghosh**  
 Department of Chemical Engineering  
 Heritage Institute of Technology, Kolkata

**PROCESSING OF SOLID AND FOAMED COMPOSITE FROM RECYCLED HIGH-DENSITY POLYETHYLENE (rHDPE) REINFORCED RICE HUSK**  
 NISHATA BOYAN<sup>1</sup>, ABU BAKAR SULONG<sup>2</sup>, SAHRIM ABDULLAH<sup>3</sup>,  
 NOR YULIANA YUSRIKA<sup>4</sup>  
<sup>1</sup>Department of Mechanical and Manufacturing Engineering  
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[https://www.researchgate.net/profile/Abu\\_Bakar16](https://www.researchgate.net/profile/Abu_Bakar16)

**Process methodology for 2,5-Furan dicarboxylic acid (FDCA)**  
 Reaction with Pure HMF and non-precious metal catalysts

**RESEARCHER:**  
 No harm working with precious metals... although those are costly...  
 But choose metal wisely... Why...?  
 Ru based catalyst: >95% FDCA yield with recyclability

Catalyst: HOF-2		Catalyst: HUF-2	
<b>Reactions Conditions</b> Temp = 120°C, O <sub>2</sub> = 10 bar	<b>Reactions Conditions</b> Temp = 120°C, Air = 10 bar	<b>Reactions Conditions</b> Temp = 120°C, O <sub>2</sub> = 10 bar	<b>Reactions Conditions</b> Temp = 120°C, Air = 10 bar
<b>Results</b> Yield of FDCA = 96.2%	<b>Results</b> Yield of FDCA = 89.2%	<b>Results</b> Yield of FDCA = 89.2%	<b>Results</b> Yield of FDCA = 83.2%
<b>Catalyst cost</b> = Rs. 1000/kg (based on metal cost & phase formed)	<b>Catalyst cost</b> = Rs. 300/kg (based on metal cost & phase formed)	<b>Catalyst cost</b> = Rs. 300/kg (based on metal cost & phase formed)	<b>Catalyst cost</b> = Rs. 300/kg (based on metal cost & phase formed)

**Feedstock comparison**

Fossil derived feedstock	Biomass feedstock
Introduction	Highly functional molecules
Introduction of functionalization	Severally containing several oxygen atoms
Multi-step approach	Reaction approach
Material technologies over past century	Developing selective catalysis with multi-functional sites
Liquid states	Solid States
Distribution as feed operation for separation	Solvent based extraction due to non volatile nature
Basic energies and techniques fairly well at & it offers natural only in past couple of decades	Recycling possible with minimum investment
	Steps for new reaction concept
	Modular plants necessary

## Valedictory Session

The Valedictory Session of the 57<sup>th</sup> Annual Convention of Chemists 2020 & International Conference on Recent Trends in Chemical Sciences was chaired by Professor G D Yadav, Padmashri, President, and Indian Chemical Society. The Valedictory Lecture was delivered by Prof. Jean-Marie Lehn, France, and Nobel Laureate 1987.

### **Synopsis for the Talk of Prof Jean-Marie Lehn:**

#### **Evolution of Matter – Complexity Information**

The *evolution* of matter is complex. It is originated from atoms. Union of atoms makes molecules; self-organisation of molecules make supramolecules and evolved into matter. The universe has generated more and more *complex* forms of molecular programming, thus also linking chemistry with *information* science. The combination of the features of supramolecular systems—information and programmability, dynamics and reversibility, constitution and diversity—leads toward the emergence of adaptive/evolutive chemistry. It is, by essence, of supramolecular nature because it is determined by interaction with an external entity. It may be constitutional and/or morphological (as occurs in “induced fit” for instance). Adaptive chemistry implies selection and growth under time reversibility. Chemistry beyond the molecule owes to the Supramolecular Chemistry that leads to molecular recognition, reactivity and transport processes. This is a spontaneous but Molecular information-controlled generation of supramolecular architectures via molecular recognition patterns following self-organisation. Implementing design and selection, self-organization offers adjustability (through self-correction, self-healing under internal dynamics); adjustability leads to adaptation (through reorganization under interaction with environmental effectors); adaptation becomes evolution, when acquired features are conserved and passed on. Adaptation is illustrated by functionally driven optimization through selection from pools of dynamically interconverting supramolecular species. Evolutive chemical systems suppose multiple dynamic processes with sequential selection/acquisition/fixation steps and undergo progressive change of internal structure under the pressure of environmental factors. But the world of selection is a brutal world, where only the fittest survives. It is ultimately for thought and design to open up a post-Darwinian era by recruiting the forces of information to override the dictate of selection!

Beyond programmed systems and in line with an evolutive chemistry, the next step in complexity consists in the design of chemical “learning” systems, systems that are not just instructed but can be trained. The incorporation of the arrow of time, time irreversibility, leads to self-organization in nonequilibrium, dissipative systems through irreversible processes. It implies the passage from closed systems to open and coupled systems that are connected spatially and temporally to their surroundings. In the long-range perspective, the development of chemical science is toward complex systems, spanning the broadest outlook from divided to condensed matter then to organized and adaptive matter, on to living matter and thinking matter, up the ladder of complexity.

### **Supramolecular Chemistry: Adaptive Chemistry**

Supramolecular Chemistry is a Dynamic Chemistry through non-covalent interactions. It provides ways and means for progressively unraveling the complexification of matter through self-organization. Complexity implies and results from multiplicity of components, interaction between them and integration i.e., correlation, coupling, and feedback. The species and properties defining a given level of complexity result from and may be explained on the basis of the species belonging to the level below and of their multibody interaction, e.g., supramolecular entities in terms of molecules, cells in terms of supramolecular entities, tissues in terms of cells, organisms in terms of tissues and so on, up to the behavior of societies and ecosystems along a hierarchy of levels defining the architecture of complexity. At each level of increasing complexity novel features emerge that do not exist at lower levels, which are deducible from but not reducible to those of lower levels.

Together with the corresponding areas in physics and biology, supramolecular chemistry builds up a supramolecular science whose already remarkable achievements point to the even greater challenges that lie ahead. They lead toward a science of complex matter, of informed, self-organized, evolutive matter. The goal is to progressively discover, understand, and implement the rules that govern its evolution from inanimate to animate and beyond, to ultimately acquire the ability to create new forms of complex matter. The perspectives opened up become wider and wider as progress is being made and will constitute horizons of the future for quite some time!

Chemistry provides means to interrogate the past, explore the present, and build bridges to the future. Molecular chemistry has created a wide range of ever more sophisticated molecules and materials and has developed a very powerful arsenal of procedures for constructing them from atoms linked by covalent bonds. Supramolecular materials are also serving as Biomaterials. World’s first Bio-absorbable heart valve is a supramolecular material prepared in our lab and used by XELTIS.

Beyond the molecule, supramolecular chemistry aims at developing highly complex chemical systems from components interacting by noncovalent intermolecular forces. It has over the last quarter of a century grown into a major field and has fueled numerous developments at the interfaces with biology and physics, thus giving rise to the emergence and establishment of supramolecular science and technology, as a broad multidisciplinary and interdisciplinary domain providing a highly fertile ground for the creativity of scientists from all origins. Both molecular/covalent and supramolecular/non-covalent are the part of Constitutional Dynamic Chemistry (CDC). Dynamic modification of constitution of chemical entities enabling ADAPTATION through constitutional variation by exchange, incorporation and decomposition of the components of a molecular or supramolecular entity in response to a physical stimulus or a chemical effector. CDC imparts recognition induced selection in biologically active substances, implementing dynamics in nanodevices, development of materials for polymers, dynamers, adaptamers.

Molecular covalent Dynamers/Dynamic Polymers undergo crossover component recombination to generate biodynamers adaptable to biology.

CDC generates networks of dynamically interconverting constituents, *constitutional dynamic networks*, presenting *agonistic* and *antagonistic* relationships between their constituents that may respond to perturbations by physical stimuli or to chemical effectors.

The implementation of these concepts points to the emergence of *adaptive* and *evolutionary chemistry*, towards *systems of increasing complexity*. Adaptation through Dynamic Constitutional Variation by component selection in response to environment/medium, phase change, physical effector, chemical effector and morphological change/switching is a step to Adaptive Chemical Systems.

### **Dynamic Covalent Chemistry (DCC): Drug Discovery**

Molecular biodynamers offer a combination of chemical, biological, and combinatorial methodologies to design and synthesize dynamic analogues of biopolymers, such as nucleic acids, polysaccharides, or proteins. In contrast to static biopolymers, synthetic molecular biodynamers feature dynamics resulting from the implementation of DCC, leading to synergistic properties, which combine biorelevant features (e.g., biocompatibility, biodegradability, biofunctionality) of the constituent components with dynamicity. In response to internal or external stimuli, biodynamers are capable of undergoing self-adaptation of their molecular constitution, 3D architecture, physical features, chemical properties, and function, in order to generate, identify, and amplify the fittest entities.

Therefore, molecular dynamers can be employed as adaptive functional biomaterials. The construction of molecular biodynamers through CDC, including DyNAs, glycodynamers, and dynamic proteoids, provides powerful tools to mimic both structure and biofunctionality of nucleic acids, polysaccharides, or proteins and to unravel the correlation between structure and functionality. However, it is still challenging to characterize the structures obtained and to design the generation of the desirable structural and functional features. Moreover, molecular biodynamers may find applications based on the respective building blocks, namely, nucleobases, carbohydrates, and amino acids. For instance, DyNAs might be of use for gene sensing, glycodynamers for cancer diagnosis and treatment, and dynamic proteoids to understand protein folding and protein–protein interactions (for instance in diseases involving protein aggregation). At present, the surface of the field has just been scratched. One may envisage an increasing emergence of biodynamers fabricated by CDC for the development of adaptive biomaterials and their implementation in the field of biomedicine, bioengineering, biotechnology, and drug delivery.

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## Award Winners in 57<sup>th</sup> ACS-2020

The Convention Awards (including Young Scientist Awards) of the 57th Annual Convention of Chemists, 2020 were awarded to the following Chemists:

### Analytical Chemistry

<p><b>Professor V. S. Tripathi Award:</b></p> <p>Aparna Neettiyath, IIT Dhanbad  <a href="mailto:aparnan@iitism.ac.in">aparnan@iitism.ac.in</a></p> 	<p><b>Indian Chemical Society Research Excellence Award :</b></p> <p>Laboni Das, University of Calcutta  <a href="mailto:labonids270692@gmail.com">labonids270692@gmail.com</a></p> 
<p><b>Professor V. Pandu Ranga Rao Award:</b></p> <p>Nabanita Naskar, SINP, Kolkata  <a href="mailto:g.nabanitanaskar94@gmail.com">g.nabanitanaskar94@gmail.com</a></p> 	<p><b>Indian Chemical Society Research Excellence Award :</b></p> <p>Pritam Singh, University of Calcutta  <a href="mailto:singhapritam1994@gmail.com">singhapritam1994@gmail.com</a></p> 
<p><b>Professor A. K. Dey Memorial Award:</b></p> <p>Shalmali Basu, University of Calcutta  <a href="mailto:shalmalibas04@gmail.com">shalmalibas04@gmail.com</a></p> 	<p><b>Indian Chemical Society Research Excellence Award :</b></p> <p>Debanjan Chatterjee, NIPER Mohali  <a href="mailto:debu06781@gmail.com">debu06781@gmail.com</a></p> 

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### Inorganic Chemistry

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**Professor B. C. Halder Memorial Award:**

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**Sri B. M. L. Bhasin Memorial Award:**

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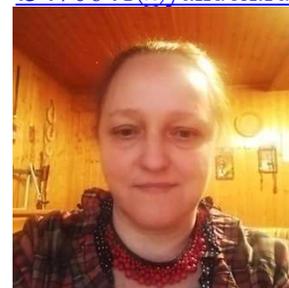
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<p><b>Dr. J. M. Dasgupta Award:</b></p> <p>Deepan Chowdhury, IIT Madras  <a href="mailto:deepan1992@gmail.com">deepan1992@gmail.com</a></p> 	<p><b>Indian Chemical Society Research Excellence Award:</b></p> <p>Saina Shaeeda MK, IISER Bhopal  <a href="mailto:sainas@iiserb.ac.in">sainas@iiserb.ac.in</a></p> 
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### Environmental Chemistry

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<p><b>Dr. Upadhyayulu Annapurna and Satyanarayana Memorial Award:</b></p> <p>Mukesh Kumar, IIT Ropar  <a href="mailto:2017cyz0004@iitrpr.ac.in">2017cyz0004@iitrpr.ac.in</a></p> 	<p><b>Indian Chemical Society Research Excellence Award:</b></p> <p>Anita Yadav, University of Delhi  <a href="mailto:aniganiwall18@gmail.com">aniganiwall18@gmail.com</a></p> 

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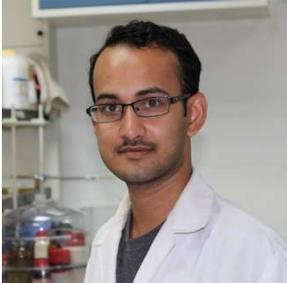


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## Chemical Engineering & Green Technology Section

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<p style="text-align: center;"><b>Indian Chemical Society Research Excellence Award:</b></p> <p style="text-align: center;">Varsha Verma, MATS University, Raipur  <a href="mailto:varsha987verma@gmail.com">varsha987verma@gmail.com</a></p> 	<p style="text-align: center;"><b>Indian Chemical Society Research Excellence Award:</b></p> <p style="text-align: center;">Dr. Arvind Gautam, NIT Hamirpur  <a href="mailto:akgautam@nith.ac.in">akgautam@nith.ac.in</a></p> 

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