

## MEETING REPORT

**Chemists cook gourmet**

Chemists, by way of their professional society, the 'Chemical Research Society of India' (CRSI) hope to achieve greater recognition for their research. They wish to increase the quantum of interest in chemistry and to improve the quality of chemical education. Since its inception in 1999, CRSI (website: <http://crsi.org.in>) has held yearly national symposia. The first was at Bangalore, followed by Hyderabad (2000), Chandigarh (2001), and this year the 'Fourth National Symposium in Chemistry (NSC 4)' was held in Pune (see Box 1). The Pune meeting saw a record of 281 posters being put up, an indicator of how vibrant ongoing chemical research in the country is. In his Presidential address, C. N. R. Rao said, 'I truly believe the future of India is related to the future of chemistry'. Twenty-seven medal lectures and six invited lectures were delivered at Pune along

with a special session on 'Chemical Education' and a micro-symposium on 'Chemical Design of Molecular Materials'.

The micro-symposium began with 'Probing the structure and polymerization of novel surfactant assemblies' by S. Ramakrishnan, IISc, Bangalore. Surfactants form aggregates or assemblies that depend on their structure and concentration in solution. Micellar aggregates require a critical concentration, called the critical micellar concentration (CMC) crucial for their formation. Ramakrishnan described his method that relied on 'near spherical symmetry' being achieved on aggregation. For specially designed surfactants, containing a non-linear optical (NLO) chromophore, the formation of micellar aggregate is reflected by the second harmonic signal. This, when plotted as a function of concentration helps to determine CMC. Other

specially designed surfactant assemblies with polymerizable units, that help the spatial confinement of the polymerizable units to specific regions, in an otherwise homogenous solution give rise to interesting systems.

Murali Sastry, National Chemical Laboratory, Pune dwelt on an aspect of significance to nanotechnology, i.e. obtaining controlled assembly of nanoarchitectures. He explained the use of bioorganisms in the synthesis of nanomaterials such as the fungus 'Verticillium' in the synthesis of silver nanoparticles with the ultimate aim of using such bionanocomposites in catalysis.

A. Ajayaghosh, Regional Research Laboratory (RRL), Thiruvananthapuram has designed organic dye-based, narrow band-gap polysquaraines polymers. With a suitable choice of donors and acceptors on the polymer chain, donor-acceptor

**Box 1. Co-hosts for the 4th National Symposium in Chemistry***National Chemical Laboratory (NCL)*

The main venue for the CRSI meeting was NCL, Pune. NCL, established in 1950, belongs to the Council of Scientific and Industrial Research (CSIR) family. Its rich tradition in both basic and applied research made it a fitting place for chemists to deliberate on various aspects of research. NCL has interests in catalysis, polymers, advanced materials, organic chemical technology, biotechnology, chemical and process engineering, chemical informatics and molecular modelling. NCL provides consultancy and technical services and is viewed as a global R&D partner by several industries, both in India and abroad.

Facilities at NCL include pilot plant for catalyst preparation, tissue culture facilities and a sophisticated analytical instrument facility. In addition, it possesses a national collection of industrial microorganisms, a micro-propagation park and an information resources centre. With a campus-wide local area network, NCL takes its library to the desktop, round-the-clock. NCL has put electronic copies of theses submitted at NCL on its network and also provides access to about 1300 journals. Website: [www.ncl-india.org](http://www.ncl-india.org)

*University of Pune*

Spread over 400 acres, in addition to core academic activities the campus has several national facilities:

Bioinformatics Distributed Information Centre (BDIC), Centre for Development of Advanced Computing (C-DAC), Educational Media Research Centre (EMRC), Inter-University Centre for Astronomy and Astrophysics (IUCAA), National Centre for Cell Science (NCCS), National Centre for Radio Astronomy (NCRA), Science and Technology Park, and Vaikuntha Mehta National Institute of Cooperative Management.

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Founded in 1948, the Department of Chemistry is recognized as a Centre for Advanced Studies in Chemistry by the University Grants Commission. In addition, a National Centre for Free Radical Research with DAE support has been recently established. A 7 MeV LINAC for pulse radiolysis studies is to be commissioned here in 2003. This department has collaborative programmes among others, also with NCL, Pune, BARC, Mumbai and with industries. The department provides consultancy and analytical services to industries that can utilize the analytical, spectral and instrumental expertise available. The department conducts M Sc, M Phil and Ph D programmes. Website: <http://chem.unipune.ernet.in>

interactions were strengthened and the conjugation length increased. As a consequence, the electronic absorption properties of polysquaraines moved towards a low optical band-gap region. This fine tuning of the properties of such pi-conjugated materials can lead to novel optoelectronic materials.

Having worked on effect of monolayers on metal clusters in the nano regime, T. Pradeep, IIT, Chennai has shifted emphasis and is using surface spectroscopy for deciphering the structure and properties, and is studying the dynamics of monolayer assemblies during phase transition. The subject of interest is formation of oxides and other coatings on clusters.

Patterning colour designs at the sub-micron scale is the work of Arun Chattopadhyay, IIT, Guwahati. Using readily available overhead projector (OHP) 'permanent marker' pens, submicron colour patterns are written on OHP paper or glass slides. For this, moulds made from polycarbonate disk and aluminium foil obtained from ordinary commercial compact disc are used which contain parallel lines in the nano-scale. These lines and arrays are then imprinted on surfaces using the moulds. Foldable substrates such as OHP are an added advantage for storing designs.

R. Dhamodharan has designed polymer brushes of nano dimensions. The method used is the technique of atom transfer radical polymerization that can make polystyrene and poly (methyl methacrylate) brushes of varying thickness from 5 to 70 nm on silicon wafer. Such densely grafted polymer chains could find uses in nanolithography.

Two gold medal lectures were delivered – one by M. V. George, RRL, on 'Clusters of bis- and tris-fullerene derivatives' and the other by R. P. Rastogi, UP Council of Science and Technology, Lucknow on 'Journey from equilibrium to far from equilibrium'. Rastogi took the

audience through an overview of some fifty years of his own research contributions. George detailed clusters formed from fullerenes which can vary in size from 100 nm to 1 mm, adopting shapes ranging from elongated wires to entangled shapes. These three-dimensionally extended structures have better charge stabilization properties compared to monomeric forms. Self-assembled molecular systems such as those seen in clusters are useful in chemical nanotechnology.

There was diverse fare laid out on the chemical research platter. The CRSI meet demonstrated that chemists in India are into several areas of research. Some of these areas are glass research, molybdenum in biology, synthesis of sugars in cyclodextrin hosts, quantum theory of chemical reactions, Huckel and the mno rules, stability of proteins, organometallic and transition metal assemblies and designing new amide-linked molecular entities. Other topics are ultrafast dynamics, oxoketenedithioacetals, non-linear optical materials, coordination chemistry, localized excitation in bichromophoric molecules, polymer chemistry and the potential of nanomaterials for electrode applications in direct methanol fuel cells.

Chemistry as a scientific discipline is central to human life and its quality. While crossing discipline boundaries, chemistry has served to enrich biology, physics, medicine and the study of advanced materials. In the process, it is often forgotten that chemistry has lent chemical synthesis and chemical analysis, building blocks for any progress in such fields. In the prevailing dim scenario for interest in basic sciences as a career choice, chemistry fails to vie for a position as a sought-after subject. Other disciplines enriched by chemistry hog most of the limelight.

So, how do chemists view the state of chemistry in India today? It is an uneven

bag. Some opinions expressed are as follows – We, chemists have islands of excellence, but large oceans of mediocrity. We need new models for sharing and management of expensive facilities, free from shackles. We need greater interdisciplinary interactions, since all the excitement in chemistry is today at interfaces of the discipline. Chemistry needs to think big. We need sizeable projects with interdisciplinary and 'cross-functional' teams, so that chemistry can lay its stake for large funding. Long-range, pre-competitive research is presently absent in the industry in India, especially in fields related to chemicals and materials. We need to channelize funding to areas of importance in contemporary chemistry, rather than spreading it too thin.

On chemical education most felt that it should be concept-based. Teaching of chemistry is not about teaching 'everything you know' approach. Students need to be made aware of 'stories of creativity' that involved human activity and human intervention. Existing cooperative education programmes could bridge the gap between university and industry, exposing graduating students to the industrial world. The Indian Association of Chemistry Teachers (IACT) in turn hopes to advance the cause of Chemistry Education.

Goverdhan Mehta who has since taken over as President of CRSI, from C. N. R. Rao, stressed the role of professional societies like CRSI in the lives of chemists. Perhaps, with increased membership, CRSI could play a pivotal role in taking chemical education forward and help in public understanding of the language of chemistry that is so intricately entwined in the daily life of people.

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