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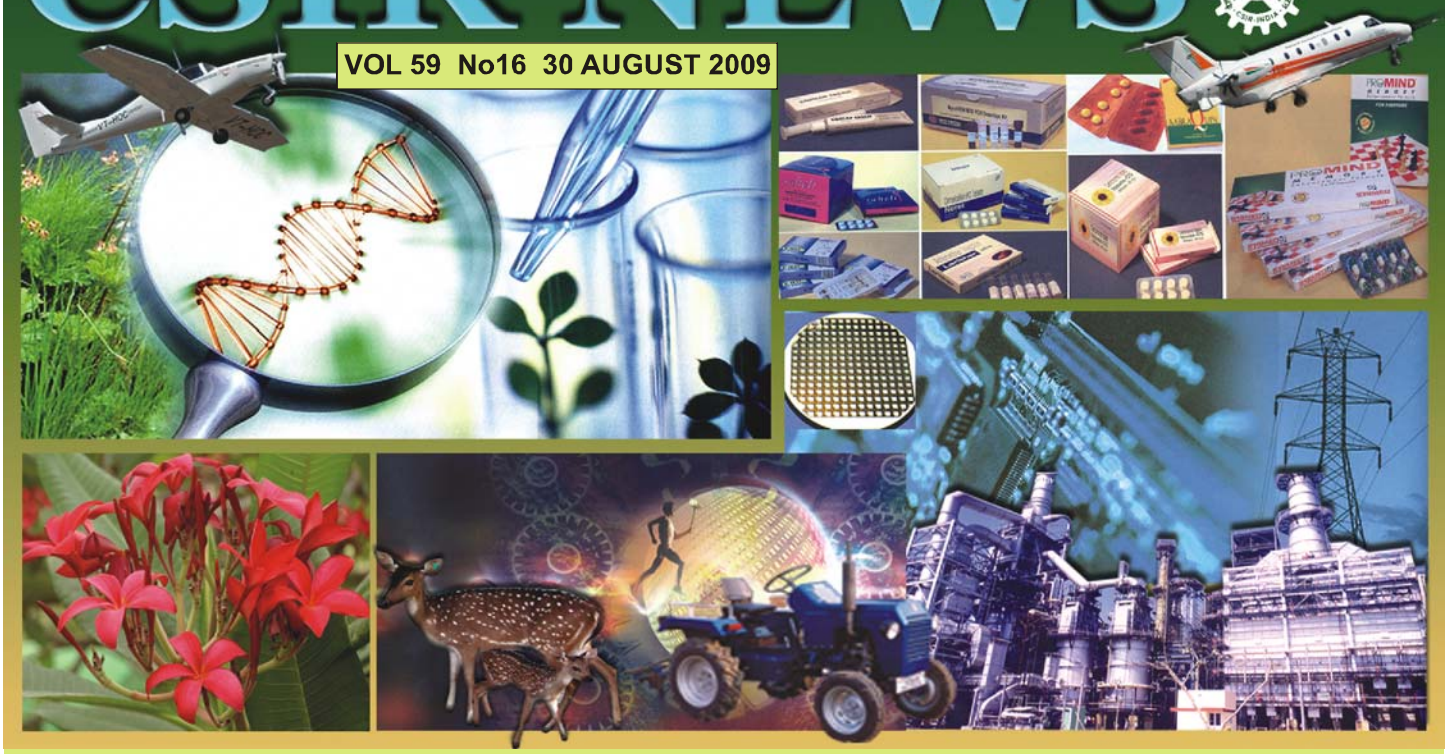

CGCRI develops PCF for the First Time in India

The Central Glass and Ceramic Research Institute (CGCRI), Kolkata, has developed for the first time in India, a special variety of non-linear photonic crystal fiber (PCF) and demonstrated its operation in generating wide band super continuum source required for various applications e.g. optical coherence tomography, spectroscopy, metrology etc.

PCF or microstructured fiber (MOF) is a special class of optical fiber made of only pure silica glass as its core and an array of air holes surrounding the core, which uniformly run across the length of the fiber constituting the cladding. Nonlinear PCF possesses high air filling fraction and it is fabricated in stack and draw process using silica capillaries. The important property of this fiber is easy tailoring of dispersion parameters over a wide range of wavelength by proper controlling of the air-hole diameter and hole-to-hole spacing. When this specially designed nonlinear PCF is pumped by suitable ultrashort-pulse laser light, it emits broad-band light from visible to near infra-red region at the output as shown in the figures.

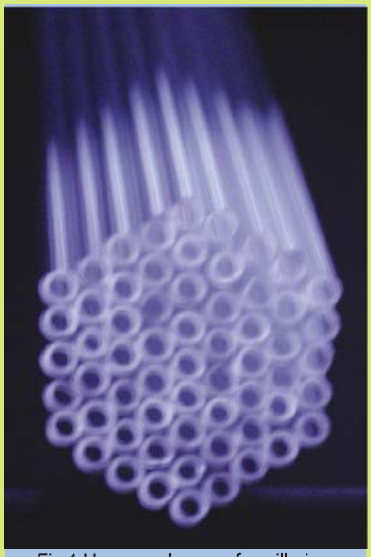

Fig.1 Hexagonal array of capillaries. Capillary diameter 3 mm

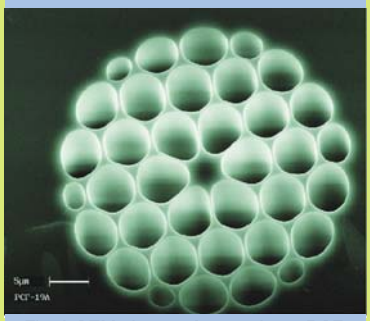

Fig. 2 SEM picture of a non-linear PCF. Fiber diameter 125 micron

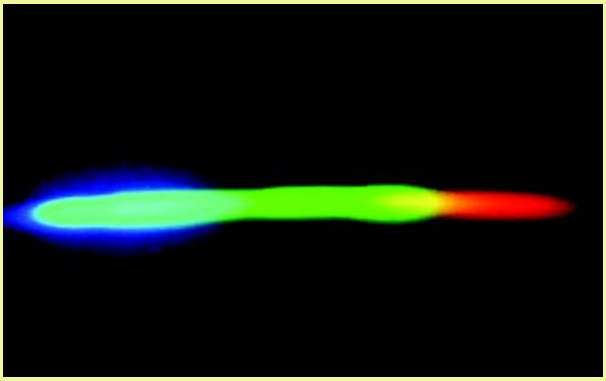

Fig. 3: Visible spectrum generated from the PCF through femtosecond pulse pumping

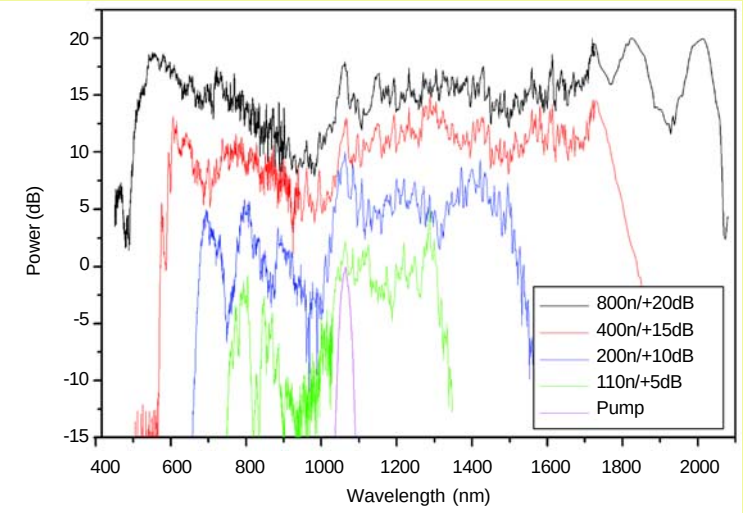

Fig. 4: Continuum spectra for 800, 400, 200 and 110 nJ incident pulse energy

A 28 cm long piece of PCF was broken off from the main 20 m long fiber, cleaved and tested. The Figure 4 shows the spectra collected for a range of pulse energies. Each spectrum was corrected and then normalized (max point set to 0 dB). For ease of viewing the spectra, the figures were offset by multiples of 5 dB. Using this fiber length, continuum spanning from 491-2060 nm (-15 dB height) was obtained when pumped with 800 nJ pulses.

R&D Highlights on Building Materials at CBRI, Roorkee

Development of New Composite Materials for Building Applications Using Plywood-Veneer and Vermiculite Waste

The charm of synthetic polymers and their products used in diverse applications is fading because these products are not biodegradable and they pollute the environment. In contrast, natural polymers are generally biodegradable but they do not possess desirable thermal and mechanical properties. Mechanical properties of the developed composite should be comparable with the properties of composites with synthetic resins and it must be capable of being processed by the established methods.

The starting raw material i.e. wood waste from veneer and plywood industries (Figure 1) is selected because its present price is very low (Rs 1.25 per kg containing higher lignin content up to 35% by wt.) while its availability is very large. The generated waste

Fig.I: Plywood - Veneer Waste

is around 10% of the total wood processed in the plants. The other proposed starting material is bagasse whose availability is also very substantial. Its cost is around Rs 1.00 per kg while lignin content is substantially low (up to 25% by wt.) and the fibre strength is also comparably low. Efforts will be made to convert lignin of wood waste of plywood/ veneer industries into an adhesive for making composites of a new class of composites replacing synthetic resins mostly derived from petroleum.

Fig. 2: Different Exfoliated Vermiculite Flake Wastes

The exfoliation of vermiculite generates powdered by-product (waste shown in Figure 2), which is seldomly used for converting into a value added product for building applications. This by-product can be easily converted into roofing tiles for thermal insulation along with polymer modified cementitious binder. Substantial amount of exfoliated vermiculite is available (around 400 MT/year) in India. Exploratory experiments have already strengthened the objective and lead to conceive a project for the development of roofing tile for thermal insulation (a composite).

The envisaged impact of the outcome of the R&D work is to provide better alternative building materials using low value down stream products of agro-industries through value addition.

Development of Polymer-based High Performance Repair Materials

The polymeric mortars have emerged as an important class of repair materials in civil engineering applications. Polymers are known to degrade at elevated temperatures but cement does not loose strength below 100°C. Higher temperature conditions prevail in several industrial buildings and structures such as coke handling plants, thermal power plants, prilling towers, chimneys, furnaces, heat treatment plants etc. This study is devoted to understand the influence of temperature and chemicals on the performance of polymeric modified mortars and to formulate suitable composition for such higher

Fig. 3: Polymer modified Repair Material under Test

temperature exposure conditions. Figure shows the bond testing of one typical formulation of repair material under slant shear test in UTM (Figure 3).

Studies are being carried out on the developed repair materials to assess the effect of thermal cycles, fire, acidic environment on the mortar samples. Influence of thermal cycles on bond characteristics is studied by using slant shear test specimens and on flexural behaviour for 60 and 120 cycles. To understand the influence of exposure to acidic environment, the specimens were submerged in a sulphuric acid solution (5%) and the changes in weight, shape, colour and compressive strength are recorded at various intervals of exposure time. The effect of thermal cycles on compressive strength of various repair mortars is shown in Fig. 4. The results of change in compressive strength of the repair mortar specimens tested at 85±2 °C (Fig. 5) in comparison to those tested at RT are shown in Fig. 6. The changes in properties of different mortar specimens dipped in an acidic solution for 180 days is shown in Fig. 7. Studies regarding fire behaviour of the above mentioned mortars is in progress.

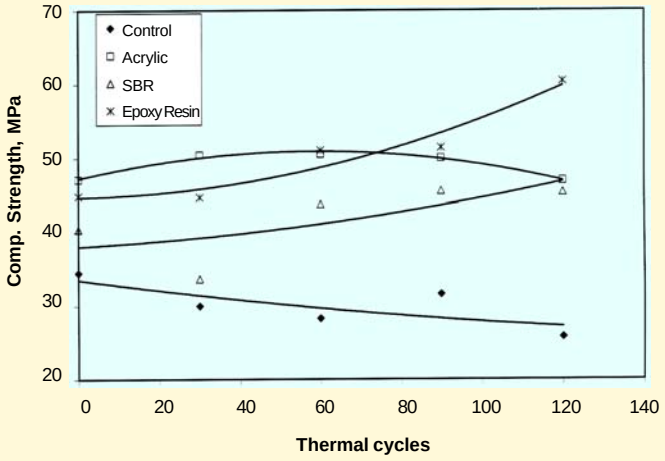

Fig. 4: Effect of number of thermal cycles on compressive strength of repair mortars

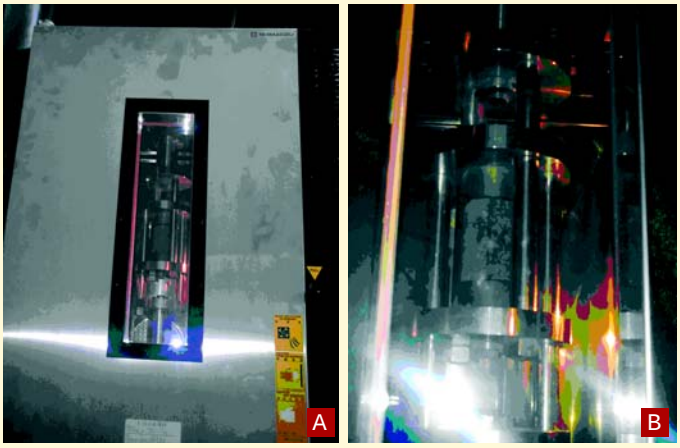

Fig. 5: Testing of repair mortars at higher temperature (a) Thermostatic chamber (b) Compression test specimen inside the thermostatic chamber

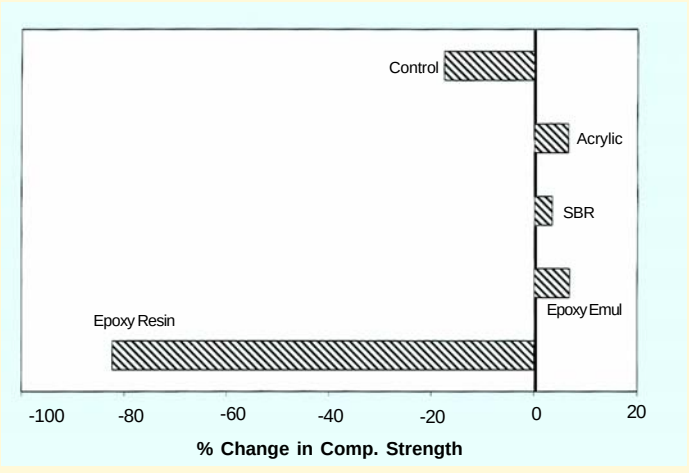

Fig. 6: Change in compressive strength of repair mortars tested at higher temperature (85°C) in comparison to those tested at RT

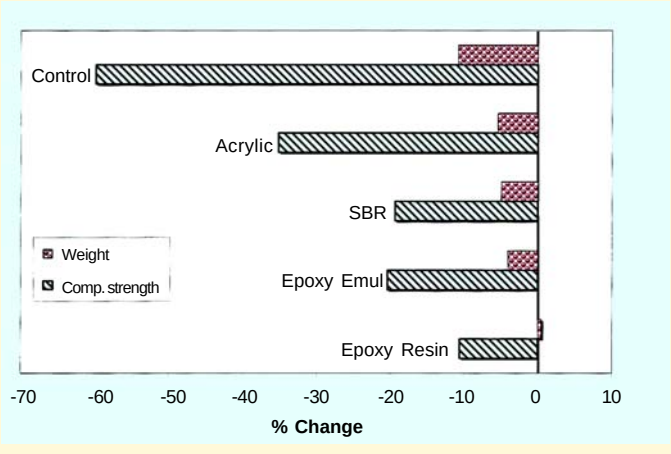

Fig. 7: Change in compressive strength and weight of repair mortars after 180 days exposure to acidic solution

Development of Coating Systems for Fertilizer Industries Based on Modified Epoxy

The demand for coatings for the protection of structures exposed to chemicals and higher temperature is huge. The coatings in the fertilizer plants, chemical industries, power plants etc. especially in the chimneys, prilling towers, etc. are exposed to higher temperatures in the range of 50-70°C and very limited coatings are commercially available for protecting the structures. The coatings based on modified epoxy resin, developed, earlier in the institute, showed very good performance when exposed to a variety of exposure environments. This has been undertaken as the basic starting material for developing a new class of coating which would be useful for protecting the steel and concrete structures. Fig. 8 shows the coated panels with developed formulations under test.

Fig. 8: Coated panels with developed formulations under test

Strategic Work for Health Monitoring and Preventive Measures for Deteriorated Concrete Structures in Thermal Power Plants

Concrete structures in the existing thermal power plants deteriorate at an alarming rate. The performances of the structures are affected by various factors such as temperature, humidity, water and airborne pollutants, and mechanical damages. In coal based power plants the burning of coal produces a very corrosive atmosphere. The exposure conditions vary from acidic to very alkaline. Materials like cement, fibres, latexes, alkyds, epoxies, urethanes, and others are used in a suitable combination, depending on the type of power plant and the specific location and exposure to prevent them from further deterioration. The repair and maintenance of different types of structures require materials and protective coatings having substantial resistance to the detrimental elements.

Presently the installed capacity of power generating units in India is about 145,588 MW, out of which the share of thermal power is around 66.6%. Coal-based thermal power plants alone are sharing around 80% of this thermal power generation in the country. Out of it the contribution of the thermal power generating units is 66.6 %. Further capacity addition of 78,000 MW is planned in the Eleventh Plan, in which coal based thermal power capacity will be 52905 MW (NTPC, 2007). Presently, there are about 120 coal based thermal power plants in India. With further addition of new power plants the maintenance of the infrastructures will be a huge task in future.

Organic Building Materials Division (OBM Division) is associated with number of projects on health assessment and repair of

thermal power plant structures throughout the country e.g. NTPC, Badapur; Kanti Bijlee Utpadan Nigam Ltd., Muzzaffarpur; NTPC, Thalchar, Orissa; NTPC, Simadri, Visakhapatnam etc. In such assignments preventive measures and repairs are suggested after carrying out rigorous non-destructive testing (NDT) of different deteriorated structures. This knowledge of project works has great economic impact as the cost of the replacements or construction of such structures need a huge amount of wealth. Besides these, the institute has developed various patching materials, reinforcement coatings and grouting materials, repair mortar and coatings for steel and concrete structures over the years and are under commercial production after transferring the know-how. Various projects have been undertaken by CBRI to study the deterioration of structures in the thermal power plants and to recommend suitable repair schemes. The repair schemes in these plant structures

Fig. 9: Typical deteriorated concrete structures of thermal power plants

Fig. 10: A Chimney after repair & coating

generally use the materials developed by CBRI. The coatings developed by CBRI have been applied on some important commercial buildings, flyovers and railway bridges including the MTP Railway Bridge in Chennai. Besides these, corrosion resistant coatings developed by CBRI have been used to coat reinforcement steel in number of structures throughout India. A few deteriorated structures are shown in Figure 9 and the repaired chimney is shown in Figure 10.

These preventive measures enhanced the service life of such structures substantially and help in saving crores of rupees of the country.

Launch of JCCC@INSTIRC - CSIR-DST's Journal Access Gateway

JCCC, a single point access to CSIR and DST's e-journal collection was launched at the National Aerospace Laboratories, (NAL), Bangalore, on 30 July 2009. JCCC - J-Gate Custom Content for Consortia is a customized web portal developed for the benefit of scientists in CSIR and DST Labs to access all e-journals subscribed by the Consortium and additionally access and share journals subscribed by each of the CSIR and DST Labs.

An excellent tool with Browse and Search facility, JCCC covers research papers from 6700+ journals with millions of articles. Allows 'Table of Contents' browsing with links to full-text if already subscribed or link to generate request for articles not available online. One can also create alerts for favourite journals.

The Scientific and L & IS professionals from NAL, Raman Research Institute (RRI), Indian Institute of Astrophysics(IIAP), Indian Academy of Science (IASc), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCR), and Centre for Liquid Crystal Research (CLCR) participated in the programme.

Dr Poornima Narayana, Head, ICAST, welcomed and briefed about the CSIR journal consortium. While explaining the reasons for subscribing to JCCC, she said that apart from cost escalation of journals, the non-availability of e-journals especially those held by M/S Elsevier, the most popular and sought after journals, were the main causes of concern. Dr Y.M. Patil, Head, Library RRI and Co-ordinator of DST Consortium, briefed the audience about the DST consortium and highlighted the benefits of CSIR and DST Consortium access.

Dr A. R. Upadhya, Director, NAL, e-launched the product. Shri N.V. Satyanarayana, CMD, M/S Informatics Pvt Ltd, Bangalore (the developers of JCCC) who was overwhelmed by the response of scientist community, briefly spoke about the J-Gate and the customized Content being offered through the Consortium. Shri Shyam Chetty, Chairman Library Advisory Committee and Head, Flight Mechanics Division appreciated the services, support and new initiatives taken by ICAST and added that the scientists are always looking forward to many more such innovative services from ICAST.

Dr A.R. Upadhya, Director, NAL, in his address showed his concern about escalating prices of journals subscription and how this consortium level approach can solve the problem to some extent. He expressed his contentment about NAL taking a major step in this direction at the initial stage of forming CSIR L & IS Consortium. He hoped that during the 12th five year plan many more high Impact Factor journals including M/S Elsevier's Science Direct would be given access to.

The vote of thanks was proposed by Shri Amit Verma of Informatics.

The training session was attended by many scientists and Shri Ravishankar of Informatics described about all the features of the tool with live examples. He also explained the advantages of creating user accounts and personalizing the tool for the benefit of scientists.

Dr T. Ramasami inaugurates Microbiology Lab at NGRI

Dr T. Ramasami, delivering his lecture

Dr T. Ramasami, Secretary, DST, visited the National Geophysical Research Institute (NGRI), Hyderabad, on 6 May 2009, and inaugurated Microbiology Lab. Dr Ramasami, delivered a lecture on the topic "Science of managing creative people" discussing about the management of creative minds and public-private partnership at the occassion. He narrated the role played by different laboratories in improving R&D status of the country with notable examples such as Green revolution, Atomic energy, Space sciences, Leather technology, Desalination of water and Groundwater Management. He mainly emphasized on the management of water resources in which NGRI has to play a vital role. He had a special meeting with the scientists working on ground water to chalk out a holistic approach to meet the water demands of the country.

After his lecture, Dr Ramasami inaugurated the microbiology lab in the campus which was established as a part of the National facility for surface geochemical prospecting for hydrocarbon research under the vision 2025.

International Workshop on Nanotechnology and Advanced Functional Materials at NCL

Prof. C. N. R. Rao delivering his talk

The International Workshop on Nano-technology and Advan-ced Functional Materials (NTAFM) was held at National Chemical Laboratory (NCL), Pune, during 9-11 July 2009. It was organized jointly with Materials Research Society of India (MRSI, Pune Chapter), and the Indian Institute of Science and Education Research (IISER), Pune. This workshop was one of the many that NCL had planned as part of its diamond jubilee celebrations that aimed to bring together many practitioners, scientists and academicians who understand the need and are willing to share the knowledge of science.

The workshop mainly aimed at highlighting how the fields of nanotechnology and functional materials that are the vehicles for the implementations of novel and futuristic applications relate and reinforce one another. This effort synergistically covered a broad range of multidisciplinary activities encompassing a spectrum of size, shape and function integrations over nano to macro scale. The workshop brought together experts, post-docs and students working in this field with a view to capture the spirit of this field and to unravel its promise. The workshop was attended by more than 350 participants including ten from industries, five each from USA and S. Korea, one each from Singapore and Australia, and about forty students from NCL. Prof. C. N. R. Rao, Director, Jawaharlal Nehru Centre for Advanced Scientific

Research (JNCASR), Bangalore, Scientific Advisor to the Prime Minister and Chairman Nano Mission, DST, New Delhi, inaugurated the workshop.

Plenary talks were delivered by distinguished Professors including Prof. C. N. R. Rao; Prof. Paul Weiss, Pennsylvania State University; Prof. Anupam Madhukar, University of Southern California; and Prof. Ajay Sood, Indian Institute of Science, Bangalore. Other invited speakers included Prof. Nitin Padture, Ohio State University; Prof. Haiwon Lee and Prof. Sung-Hwan Han of Hanyang University, Korea; Dr Supratik Guha, Head Photovoltaics Division, IBM, USA; Prof. D. D. Sarma, IISc, Bangalore; Dr Rajeswaran of Moser Bear, New Delhi, etc. There were 15 oral presentations and about 200 poster presentations in two sessions.

Prof. Rao said that area of liquid-liquid interface in nanomaterials has many research opportunities since the interface between water and an organic liquid had not been investigated adequately for preparing nanocrystals and thin film of materials. He said this while delivering a plenary talk on 'the liquid-liquid interface as a medium to generate materials'. He said that the air-water interface is generally employed to prepare particle assemblies and films of metals and semiconductors. The liquid-liquid interface provides an excellent medium for preparing ultrathin nanocrystalline films of metals, metal chalcogenides and oxides. The method involves reaction at the interface between a metal-organic compound in the organic layer and an appropriate reagent for reduction, sulfidation, selenidation etc. in the aqueous layer. The formation of ordered thin films of nanocrystals at the interface has been examined by diffuse x-ray scattering and *in-situ* atomic force microscopy. Rheological measurements have also been carried out at the interface. Some of the two-dimensional nanomaterials so obtained are of Au, Ag, Pd, Au-Ag alloys, CuS, ZnS, PbS, CuSe, CdSe, CuO, ZnO and $Cu(OH)_2$. Interestingly, many of the films are single crystalline. The results demonstrated the versatility and potential of the liquid-liquid interface for preparing nanomaterials and ultrathin films and therefore encourage further research in this area. It can be stated as a significant development in the field of nanomaterials. Results of studies on the effect of thiols as well as surfactants on the structure and the surface plasmon band of metal films were also presented.

Dr Sivaram, Director NCL while introducing Prof. Rao said that he is the leading face of scientific research in India and a person that symbolises the hopes and aspirations of Indian science. Dr Sivaram said it was very difficult to introduce and speak of Prof. Rao's numerous credentials under whom he learned chemistry. Prof. Rao's identity in the minds of people is remembered often for his caring human nature. His influence in chemical science is unmatched, in various capacities for example in being a spokesman in public policies and for taking science to its highest

Dr Sivaram giving welcome remarks

level in the country. The stupendous height that Prof. Rao has acclaimed in India is something to take serious note of. Indeed, Prof. Rao has set an example to India at a time when there were not as many facilities available and made the saying true that 'where there is a will there is a way'.

Prof. Y. Chae, former Minister of Science and Technology, South Korea, congratulated the organizing committee for successfully organzing the workshop and thanked the Asian Research Network. He said it was his first visit to India and he had in mind India to be having brilliant ancient culture. He was eager to meet the scholars in India and discuss about the possible future cooperation. He said that new discoveries are being made everyday and the bright scholars were pressing these discoveries into new products in imaginative ways. This is an exciting area to explore. In order to explicit this kind of progress it is most important to share the kind of

problems that are faced and discuss the ones needed to be solved. He believed that this workshop would provide vehicular ground to share the wisdom to solve it. Finally he thanked the members of the committee.

Earlier, Dr Satishchandra Ogale, Scientist, NCL and Convenor of the workshop welcomed the distinguished guest and the audience. He briefed the purpose and the contents of the workshop. The areas covered included Nanotechnology, Nano-composites, Hybrid materials, Materials for energy applications, Molecular and flexible electronics, Materials for biomedical applications and Soft functional materials.

Dr Ogale thanked the joint organizers and acknowledged with gratitude the sponsorship of CSIR; Department of Science and Technology (DST); Department of Information Technology (DIT); Department of Atomic Energy (BRNS); NCL; IISER; C-MET as well as Industrial company sponsors M/s Icon Analytical; M/s Pfeiffer; M/S Laser Science, M/s Excel Industries; and M/S Toshniwal Brothers.

Workshop on Nanomaterials and their Applications

Dr H. S. Maiti, Director, CGCRI, delivering welcome address. Seated on the dais (*from left*) are: Dr Goutam De, Prof. C.-R. Wang, Prof. J.-G. Han, Shri A. Chakraborty and Dr P. Rupal

A joint workshop on Nanomaterials and Their Applications was held during 24-27 March 2009, at the Central Glass and Ceramic Research Institute (CGCRI), Kolkata, under a collaborative agreement between India's Council of Scientific and Industrial Research (CSIR) and China's National Science Foundation Council (NSFC). The workshop focused on the important areas of nanoscience and technology. These areas were Nano-photonics, Synthesis and characterization of nanomaterials, Bio-materials, Hybrid composites, Energy materials, Functional materials and Nano-carbon.

Dr H. S. Maiti, Director, CGCRI and joint coordinator of this workshop welcomed the Chinese and CSIR delegates representing the Chinese and the CSIR laboratories. Prof. Jian-Guo Han, Director General, Bureau of International Cooperation, National Natural Science Foundation of China expressed his pleasure to be in India and indicated that he would be very happy if some collaborative research activities between Chinese and CSIR scientists follow up in the area of nanoscience and technology. In all, 17 Chinese and 27 Indian scientists participated in the workshop. A total of 32 lectures (17 from India and 15 from China) were presented in the workshop.

In the Nano photonics area, Dr Suresh Das of National Iinstitute for Interdisciplinary Science and Technology, Thiruvananthapuram, spoke on the design and study of photoresponsive materials such as liquid crystals, gels and luminescent solids. Dr R. Debnath of CGCRI described the luminescence of Eu^{3+} and Er^{3+} ions in nano-structured glass and ceramics. Dr S. N. Sharma of NPL, New Delhi, presented work on core/shell quantum dots.

In the area of Synthesis and Characterization of Nanomaterials, Prof. L. Guo of Beijing University of

Aeronautics and Astronautics, spoke on the synthesis, characterization and properties of one-dimensional (1D) nanomate-rials (wires, rods and tubes). Dr K. G. K. Warrier of NIIST, demonstrated the synthesis of photocatalytic titanium oxide nanoparticles (NPs) by sol-gel which has been scaled up to semi-industrial scales. Prof. Q. Liu of National Center for Nano Science and Technology, Beijing, presented different technologies of nanofabrication in order to develop nano-devices. Dr R. Mukherjee of CGCRI presented work on self organized meso and nano patterning of thin polymer films. Prof. G. -W. Meng, Director, Laboratory of Nanomaterials and Nano-structures, Chinese Academy of Sciences (CAS), reported a generic synthetic approach of 1-D branched and hetero-nano-structures via aluminum oxide templates. Dr R. K. Rana of IICT presented the bio-inspired synthesis of nanostructured materials having potential applications in catalysis and encapsulation of other nanoparticles. Prof. Z. Zhang of Tsinghua University, Beijing, presented work on glancing angle depo-sition to grow 1D nanostructures of several metal oxides and metals.

In the area of Bio-materials, Dr X. -Y. Jiang of National Center for Nano-Science and Technology, Beijing, described the micro/nano scale tools for biomolecular analysis useful for molecular diagnostics, analysis of food and environmental monitoring. Dr (Ms) Archana of IGIB, New Delhi, described the interaction of polyethyleneimine-NP-neuclic acid and cell toxicity. Dr (Ms) S. Nayer of NML, Jamshedpur, presented work on biomimetically synthesized hydroxyapatite nano-composites. Dr N. M. Rao of CCMB, Hyderabad, described the immobilization of enzyme molecules on NPs leading to biosensing. Dr S. Maiti of IGIB reported the toxic effects of metal NPs of specific size in living cells.

The session on Hybrid Composites started with the presentation of Prof. J. Xu of Institute of Chemistry, CAS who presented work on the development of polyurethane-clay (montmorillonite) nanocomposites. Dr G. De of CGCRI, organizer of this workshop from CSIR side, presented the work on the development of inorganic-organic hybrid nanocomposite coatings including the metal and oxide nanoparticles doped hybrids. He mentioned that one of the CGCRI inventions, hard-coatings on plastic ophthalmic lenses is being commercially utilized in India. Prof. L.-W. Yin of Shandong University, Jinan, said that the atomic level hybrids of Boron-Carbon-Nitrogen ($BC_{1-x}N_x$) are expected to have various band gap energies controlled by their composition and could find applications as a new light-emitting material, bio-sensors and nanodevices. Dr (Ms) Bharathi and B. J. Basu of NAL, Bangalore, presented their work on the development of superhydrophobic coatings based on organic-inorganic hybrids.

In the area of Energy Materials, Dr R. N. Basu of CGCRI reported work on $La_{1-x}Sr_xFe_{1-y}Co_yO_3$ (LSCF)-based nanostructured cathodes for solid oxide fuel cell applications. Prof. R.-F. Peng of Southwest University of Science and

Participants of CSIR-NSFC joint workshop

Technology, Mianyang, described the synthesis energetic fullerene derivatives and their applications. Dr A. Das of CSMCRI, Bhavnagar, described the photo induced interfacial electron transfer dynamics on Dye sensitized electron injection to the titania nanoparticles. Dr S. Kurungot of NCL, Pune, reported the development of electro catalysts and membrane electrode assemblies for polymer electrolyte membrane fuel cells (PEMFC).

The session on Functional Materials started with the presentation of Prof. J.-C. Hao of Shandong University, Jinan. He described the self assembly of hybrid materials at the water air/water interface leading to the formation of highly ordered honeycomb architectures. Prof. W.-G. Song of Institute of Chemistry, CAS, Beijing, described the development of nano-structured materials (metal oxides, metal NPs) applicable for catalysis and water treatment. Dr (Ms) P. S. Devi of CGCRI reported the new synthetic strategies to prepare nanomaterials (oxides and metal NPs) exhibiting functional properties. Prof. C.-Z. Gu of Institute of Physics, CAS, Beijing, reported the magnetic logic gate fabricated by metal nanostructures which could lead to development of spin device. Dr A. Mitra presented the overview of NML's activities on nanostructured functional and structural materials. Prof. D.-P. Yu of Peking University, Beijing, presented work on the development of varieties of 1D ZnO (including doped) nanowires applicable for nanodevices.

The last session on Nano-Carbon began with a lecture of Prof. Y. Li of Peking University, Beijing. She described the synthesis of high-density arrays of perfectly aligned single walled carbon nanotubes (semiconducting) on ST-cut single crystal quartz substrates. Prof. C.-R. Wang (joint coordinator from NSFC) of Institute of Chemistry, CAS, Beijing, reported their work on the development of different types fullerenes such as unconventional fullerenes, fullerenes and endohedral metallofullerenes, and their applications including magnetic resonance imaging (MRI). Prof. J. Zhang of Peking University described the controlled CVD growth of single walled carbon nanotubes.

A panel discussion session followed the technical sessions. Some areas identified by the panel were: carbon nanotubes/ fullerenes, nanomaterials for water purification, health care and drug delivery, nanoelectronics, nanoporous materials for CO_2 absorber, mesoporous solids and hybrid nanocomposites. The panel recommended greater focus on the said areas in the future NSFC-CSIR collaborations and in the subsequent workshops. Both NSFC and CSIR delegates agreed to speed up the collaboration between suitable partners and submit joint projects.

Training Programme on Advanced Instrumentation

The Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, organized a training programme on 'Advanced Instrumentation and Analytical Techniques for Natural Products' during 10-16 June 2009. The programme was attended by seventeen participants representing industries, universities and research organizations from different states like Assam, Maharashtra, Punjab, Rajasthan, Uttarakhand, Delhi and Uttar Pradesh. The participants were from Defence Institute of Bio-Energy Research (DIBER), Uttarakhand; CIMAP, Lucknow; DRL, Tejpur; North Eastern Hill University, Shilong; Punjab University, Chandigarh; Department of Zoology, Lucknow University; Saroj Institute of Technology, Lucknow; Delhi University; Maharastra Agriculture University; and Banasthali University, Rajasthan.

A hands-on training was given to participants on different modern instruments like Gas Chromatograph (GC), GC-Mass spectrometer (GC-MS), Liquid chromatography equipments NMR, FTNIR and ICP etc. The instruments are used in the analysis of natural products for getting qualitative results. The participants were exposed to the latest techniques used in the analysis of natural products.

In the feedback given by the participants, most of them were of the opinion that the training will really be helpful to the students. They learnt about a number of advanced instruments and techniques, specially those used in the pharmaceutical field. They felt that these will be very useful for pursuing their career in field of pharmaceuticals.

In view of its utility this specialized training programme organized by CIMAP once every year is becoming very popular among the researchers and the academician.

Technology Day Celebrations at CLRI, CSIO and NGRI

An account of the National Technology Day Celebrations at the Central Leather Research Institute (CLRI), Chennai; Central Scientific Instruments Organisation (CSIO), Chandigarh, and National Geophysical Research Institute (NGRI), Hyderabad, is given here:

Central Leather Research Institute, Chennai

Environment friendly bio-processing of hides and skin to leather using enzymes in the pre-tanning process, a technology that can make India a world leader, is nearing commercialization. The Central Leather Research Institute (CLRI), Chennai, the lead institute in the development of the new technology is in talks with tanneries to field test the new process, and with leather chemical manufacturers for the large-scale production of the new bio-process materials.

Dr A. B. Mandal, Director, CLRI, addressing the distinguished gathering during NTD Celebrations

Speaking on the occasion of Technology Day on 11 May 2009, Dr A. B. Mandal, Director, CLRI, said that transfer of technology developed by scientists at CLRI should be utilized by entrepreneurs properly. A collaborative effort by a dozen research institutes and universities in the country under the New Millennium Technology Leadership Initiative (NMITLI) of CSIR resulted in this break-through, said Dr Mandal, Director, CLRI, which is one of the nodal agency for NMITLI for leather. He added that the NMITLI network developed 18 technology leads and short-listed six combinations of about 40 enzymes.

CLRI scientists, in partnership with tanneries in different regions, would undertake field trials to assess the technical feasibility of these enzymes in processing leather. The greatest challenge for the scientists, he said would be changing the mindset of the tanners and convincing them that quality leather could be produced using enzymes. The use of enzymes will have a dual effect. On the one hand, it would eliminate the environmental problems associated with the solid and liquid wastes. On the other, it would avoid chemical pollution of the tannery wastes that can be processed into useful materials.

According to a CLRI data, the amount of waste discharged from processing a tonne of leather includes about 750 kg of solid waste. Of this, about 350 kg would be lime-sulphide , 40,000 liters of liquid waste and 450 kg of total dissolved solids. Dr Mandal said when the bioprocess technology is operated the leather industry would be able to meet the Pollution Control Board norms on total dissolved solids in effluents and on solid waste in leather production.

Dr Mandal said that the development of the bioprocess of hides under the NMITLI was conducted in three phases. The first phase comprised of the research and development work. The technology was developed in the second phase and now it is ready for the third phase of commercialization.

Earlier, R. Krishna Kumar, Managing Director of Salem-based Shervaroys Health Care Products, said that despite manufacturing a collagen-based, superior wound and burn care management product, marketing it was a big challenge. According to him, the single application of the collagen-based product was far superior to existing ones. The collagen sheets produced from bovine tissues, collected from

slaughter houses, is a cost-effective and affordable material to treat wounds, burns and ulcers. This import-substitute material developed and patented by CLRI was being produced in a world-class facility and marketed in India and abroad.

CLRI was in talks with a Malaysian company for the transfer of the collagen technology, Dr Mandal informed.

Certificates and performance awards for CLRI staff were given away on the occasion.

Central Scientific Instruments Organisation, Chandigarh

At CSIO, Technology Day was celebrated by organizing Brainstorming Session on Bio Nano Photonics for Healthcare and Agriculture on 11 May 2009. Dr R.K. Khandal, Director, Shriram Institute for Industrial Research, Delhi, inaugurated the event. In his address, he stressed on how to relate the academic research to industrial product development under global competitiveness. He highlighted on the need of finding simple scientific and marketable solutions to complex problems. He opined that the recent progress in Bio Nano Technology and Photonics can be converged to devise various highly sensitive sensors for disease and pathogen detection.

Earlier, Dr Pawan Kapur, Director, CSIO, while welcoming the Chief Guest and other eminent scientists, highlighted the importance of the Technology Day. It was on 11 May in the year 1998 that Pokharan-II Nuclear tests-Shakti were carried out successfully. Besides this, on this day the second prototype of the *HANSA-3* had its successful inaugural flight which marked a major milestone in the *HANSA* programme and the *Trishul* missile were field successfully from the ITR, Balasore, Orissa. He, in his address, termed Bio Nano Photonics as Golden Jubilee Project of CSIO as the institute has strong foundation in optics and photonics. He expressed hope that the combination of Bio Nano Technologies will lead to creation of a new knowledge and innovation for the benefit of society.

Dr Lalit M. Bharadwaj, the Convenor of the event gave an outline of the programme and emphasized on the need for innovation in achieving sizedle impact on the economy.

The panel discussion was chaired by Dr Pawan Kapur. The panel expressed the need of a network of the specialists and laboratories working in this area to focus on the product oriented research. An urgent need of having incubation facility for close public-private partnership in every laboratory was also realized during the discussion.

Dr S. Arora of PGI, Chandigarh; Dr Harsh of Solid State Physical Laboratory, Delhi; Prof B.R. Mehta of Indian Institute of Technology, Delhi; Dr S. Mokkapati of Indian Council of Medical Research, Delhi; and Dr G.V. Ramaraju of Department of Information Technology, Delhi, were also present on the occasion.

National Geophysical Research Institute, Hyderabad

At NGRI, the Technology Day Lecture was delivered by Shri D.K. Pande, Director (Exploration), ONGC, New Delhi, who was introduced to the audience by Dr B. Rajendra Prasad, Scientist, NGRI. Speaking on 'Hydrocarbon Exploration – Riding Technology Wave', Shri Pande narrated the latest technology development in oil exploration and exploitation. He stressed the need for utilization of non-conventional sources such as coal bed methane, shale gas and gas hydrates and also environment friendly and perennial energy resources such as wind energy and solar energy. He answered all the queries made by a large number of students present in the audience.

Earlier, Dr V.P. Dimri, Director, while welcoming the distinguished gathering gave a glimpse of the latest achievements of the institute with special reference to publications and patents.

Dr Y.J. Bhaskara Rao, Scientist, NGRI, proposed a vote of thanks.

Prof. Paul Weiss delivers Prof. McBain Memorial Lecture at NCL

Prof. Paul Weiss, Professor of Chemistry and Physics and Founding Director of the Center for Molecular Nanofabrication and Devices at the Pennsylvania State University, USA, delivered the Eighth Prof. J.W. McBain Memorial Lecture on 'Designing, Measuring and Controlling Molecular and Supramolecular Scale Properties for Molecular Devices' at the National Chemical Laboratory (NCL), Pune, on 9 July 2009. This lecture was part of the international workshop on 'NanoTechnology and Advanced Functional Materials' organized by NCL jointly with Materials Research Society of India (MRSI, Pune Chapter), and the Indian Institute of Science and Education Research (IISER), Pune held during 9-11 July 2009.

Prof. Paul Weiss delivering Prof. McBain Memorial Lecture

Prof. Weiss in his lecture described the studies performed by him and his team on molecular devices. He exemplified the use of molecular design, tailored syntheses, intermolecular interactions and selective chemistry to direct molecules into desired positions to create nanostructures and to serve as test structures for measurements of single or bundled molecules. He showed that the interactions within and between molecules can be designed, directed, measured, understood and exploited at unprecedented scales. The interactions that influence the chemistry, dynamics, structure, electronic function and other properties were examined and used advantageously to form precise molecular assemblies, nano-structures, and patterns, and to control and stabilize function. These nanostructures can be taken all the way down to atomic-scale precision or can be used at larger scales. He showed how molecules can be selected and tailored to exhibit precise intermolecular interactions. His work has led to proposals of mechanisms for electronic switching and driven motions by varying molecular design and chemical environment. Critical to understanding of these variations has been developing the means to make tens to hundreds of thousands of independent single-molecule measurements in order to develop sufficiently significant statistical distributions, comparable to those found in ensemble-averaging measurements, while retaining the heterogeneity of the measurements. The conductances of molecule-substrate junctions are quantitatively compared. It is found that the contacts and substrate play critical roles in switching. Switching of rigid, conjugated molecules is owing to changes in the molecule-substrate bonds, which involves motion of the molecules and of substrate atoms. He demonstrated that his team is capable of measuring the coupling of the electrons of the molecules and substrate by measuring the polarizabilities of the connected functional molecules in high and low conductance states. These polarizabilities are compared to those of other families of molecules and to detailed calculations.

Prof. Weiss's lecture was an exquisite illustration of how with modern tools one can precisely control structure-function relationships and make precise measurements of properties at a molecular as well as molecular ensemble levels. Dr S. Sivaram, Director, NCL, welcomed the audience and presented the reminiscences of Prof. McBain who was the first Director at NCL. He said, Prof. McBain was a surface and colloid chemist of great distinction and the one who introduced the word 'sorption' into the lexicon of science. Dr Sivaram said that Prof. McBain visualized the laboratory as being a service institution that would make specialized knowledge available to anyone for the development and advancement of India. In order that the scientists would not forget this objective, Prof. McBain worded it into *a motto* for all to read as they enter the hall of NCL *'The purpose of this laboratory is to advance knowledge and to apply chemical science for the good of the people'*.

Prof. Samir K. Brahmachari chosen as One of 25 Most Valuable Indians

Prof. Samir K. Brahmachari, Director General, CSIR, has been chosen as one of the 25 most Valuable Indians by *The Week* magazine (see issue dated 16 August 2009 which is an "ode to …visionaries"). Prof. Brahmachari joins illustrious peers such as Shri Ratan Tata, Shri Nandan Nilekani, Dr A. R. Rahman, Shri Wajahat Habibullah, Prof. Ashis Nandy, Shri O.P. Bhatt, Shri E. Sreedharan, Shri Rahul Gandhi, Ms Vandana Shiva, Ustad Amjad Ali Khan and others.

This special Independence Day issue of *The Week* features men and women who will "play a role in dealing with …demons of our democracy."

In the Editorial of the Independence Day issue of *The Week*, Managing Editor, Philip Mathew has lauded Prof. Brahmachari's work in genomics which "… could lead to new treatments for a range of disorders that afflict millions of Indians." In addition, he has praised CSIR's "…new project which aims at making available drugs for tuberculosis at an affordable price." In the Editorial, Philip Mathew says that "Progress emerges from such dreams, and their relentless pursuit."

Dr Krishnananda Chattopadhyay, IICB, receives Indo-US Research Fellowship Award

Dr Krishnananda Chattopadhyay, Scientist E-I, Indian Institute of Chemical Biology (IICB), Kolkata, has received the prestigious Indo-US Research Fellowship Award for the Year 2009 in recognition of his outstanding contribution to the field of Life Sciences.

The award provides an excellent opportunity to young Indian scientists and technologists of all disciplines, under the age of 40 years to interact with the American scientific community and acquaint themselves with new scientific research methods and enable them to carry out a clearly defined research project at a place of their choice in USA upto a period of 12 months.

Science and Engineering Research Council (SERC) of Department of Science and Technology, Government of India, and Indo-US Science & Technology Forum (IUSSTF) have jointly launched the Indo-US Research Fellowship Program for Indian Researchers.

After receiving his Ph. D. from Tata Institute of Fundamental Research in 2000, Dr Chattopadhyay moved to Washington University School of Medicine for his post doctoral studies with Prof. Carl Frieden where he has developed the first application of Fluorescence Correlation Spectroscopy to study protein folding dynamics. He subsequently joined Pfizer Global Biologics as a senior scientist in the biologics formulation development group prior to joining Indian Institute of Chemical Biology.

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