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CSIR News

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In This Issue

In The News

CSIR-NIO Bags its Largest Ever Industry-sponsored Project

THE CSIR-National Institute of Oceanography (NIO), Goa, has been awarded a Rs. 17.94 crore project by the Oil and Natural Gas Corporation (ONGC), India's largest public sector petroleum company, to collect geophysical data from its oil field in the Krishna-Godavari basin off the east coast of India. In monetary terms this is the largest industry-sponsored project ever taken up by NIO.

Under this project CSIR-NIO will carry out surveys involving multi-beam bathymetry, magnetic, high-resolution sparker, deep-tow sub-bottom and side scan sonar imaging of the seafloor. It will also determine water column temperature and salinity up to a depth of approximately 900 meters. The data will help ONGC in laying pipelines for transporting oil and gas from their G-4, D and E oil and gas fields, and the development of other offshore production facilities.

The project is being implemented by a combined team of scientists from CSIR-NIO's Regional Centre at Vishakhapatnam and its headquarters in Goa.

CSIR-National Institute of Oceanography

R&D Highlights

CSIR-IICT Researchers Develop Novel Method for Detection of Gold Ions

Gold has been deeply embedded in the collective conscience of mankind since the beginning of known history. The glittering metal has always exerted a deep fascination, being associated with beauty, wealth and authority probably due to its collective and unique properties such as high density, softness, malleability, ductility.

Gold (Au) in free elemental form does not get oxidized by air or water as evident by its occurrence as nuggets or grains in rocks, in veins and in alluvial deposits (Figure 1). Such high stability of gold in nature might have created misconceptions amongst the scientific community that the metal is extremely inert and therefore its salts cannot be used as catalysts for organic reactions.

This could be the reason why gold has lived in the shadow of other metals for a long time. The myth is that gold salts act as highly efficient catalysts for many unprecedented reactions and in recent years the reactions catalyzed by gold salts are becoming very popular.

Apart from their catalytic activity, gold salts exhibit some biological effects. For instance, gold ions have anti-inflammatory properties and are used as pharmaceuticals in the treatment of cancer, arthritis and tuberculosis. In addition, it is well established that gold ions are known as inhibitors of macrophages and polymorphonuclear leucocytes. However, gold species may tightly bind to biomolecules such as enzymes and DNA, leading to toxicity to humans. Similarly, certain gold salts such as gold chloride are known to cause damage to the liver, kidneys, and the peripheral nervous system.

Based on the sharp increase in gold catalysis and toxicity associated with gold ions, it is essential to develop a chemosensor to monitor the presence of gold species both in the environment and under physiological conditions. In general, the development of chemosensor for the detection of gold is based on two approaches.

The first is the complexation based approach wherein the non-fluorescent probe, containing a fluorophore and a gold ion receptor, binds with Au ions triggering change in the fluorescence intensity (Figure 2A). Another approach involves a non-fluorescent probe consisting of a fluorophore and organic molecule which on reaction with gold species generates a new structure resulting in a change in the fluorescence intensity (functional group manipulation approach, Figure 2B).

Scientists at IICT have come up with a new approach involving anchoring-unanchoring of the fluorophore (Figure 2C). It can be judged from Figure 2C that the fluorescence of fluorophore is turned off by anchoring with organic substrate. Once the gold ions have been sensed, the probe would liberate highly fluorescent fluorophore with formation of organic product.

The required probe **X** was easily synthesized from 2-iodobenzoic acid, phenyl acetylene and methoxy-fluorescein using conventional methods. As depicted in Figure 3, the organic reaction was triggered in the presence of gold ions (cf. **Y**) liberating

Fig. 1. Gold – Traditionally considered as Inert Metal

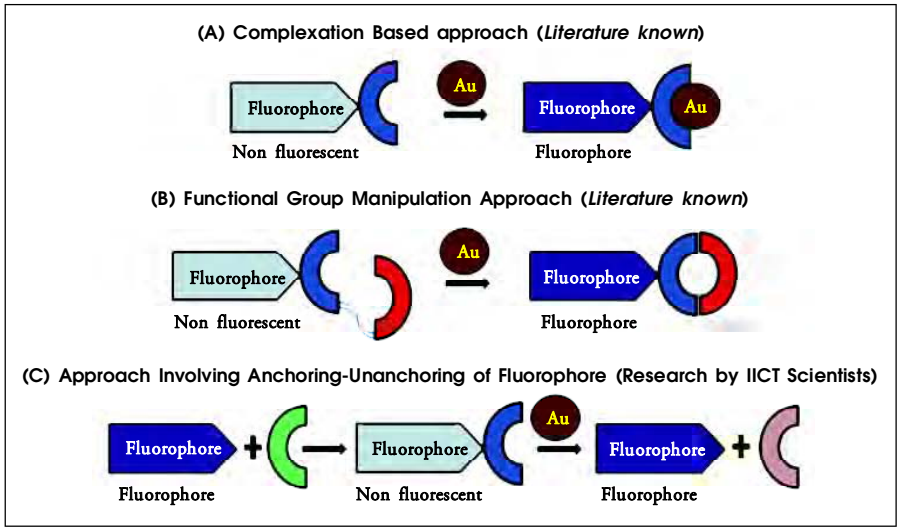

Fig. 2. Detection of Gold ions – Various approaches

isocoumarin and highly fluorescent methoxy-fluorescein whose fluorescence was easily measured with analytical techniques.

The solution of probe **X** in CH_3CN/PBS buffer (1:1, pH = 7.4) is colourless and exhibits negligible fluorescence. However, the addition of Au^{1+} ion to probe **X** triggers a large enhancement in fluorescence ($ë_{max}$ = 515 nm). The time dependent fluorescence response of probe **X** (10 μM) with Au^{1+} (100 μM) showed a rapid increase in intensity up to 30 min and then saturates (Figure 4).

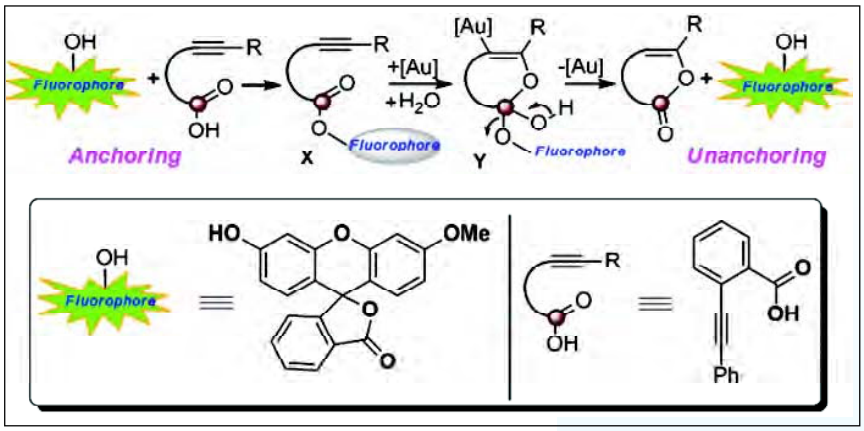

Fig. 3. Anchoring/Unanchoring of Fluorophore – Underlying mechanism

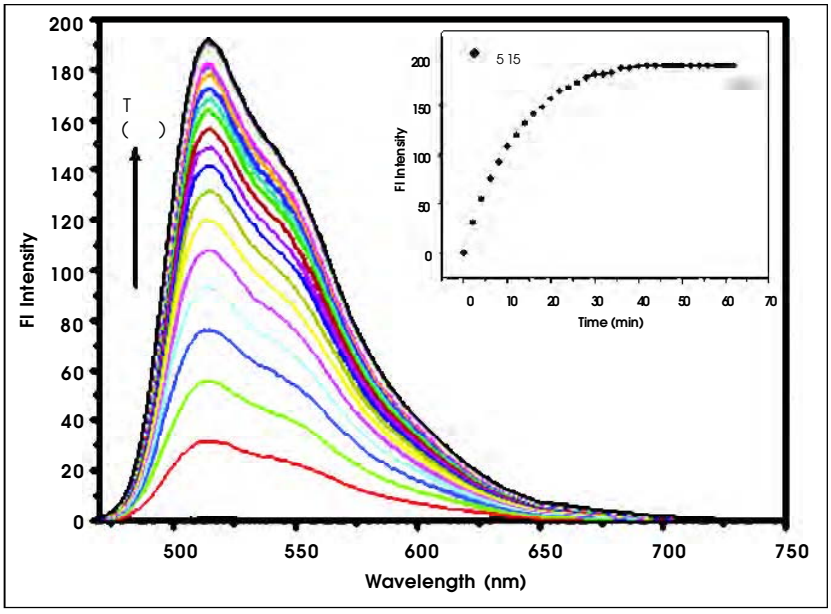

Fig. 4. Time-dependent fluorescence change obtained for a mixture of X (10 μM) and Au^{1+} (100 μM) in CH_3CN:PBS buffer (1:1, 0.1M, pH = 7.4). λ_{excit} 452 nm. Inset: Plot of fluorescence intensity at 515 nm against time.

Figure 5 reveals that probe **X** shows special selectivity towards Au^{1+} and Au^{3+} metal ions only. Fluorescence response of other metals such as Ag^{1+}, Ba^{2+}, Bi^{3+}, Fe^{3+}, Hg^{2+}, Ir^{3+}, K^{1+}, La^{3+}, Mn^{2+}, Ni^{2+}, Pd^{2+}, Pt^{2+}, Pt^{4+}, Ru^{3+}, Sc^{3+}, Yb^{3+}, Zn^{2+}, Cd^{2+}, Cr^{3+} is negligible. It is evident that the interference

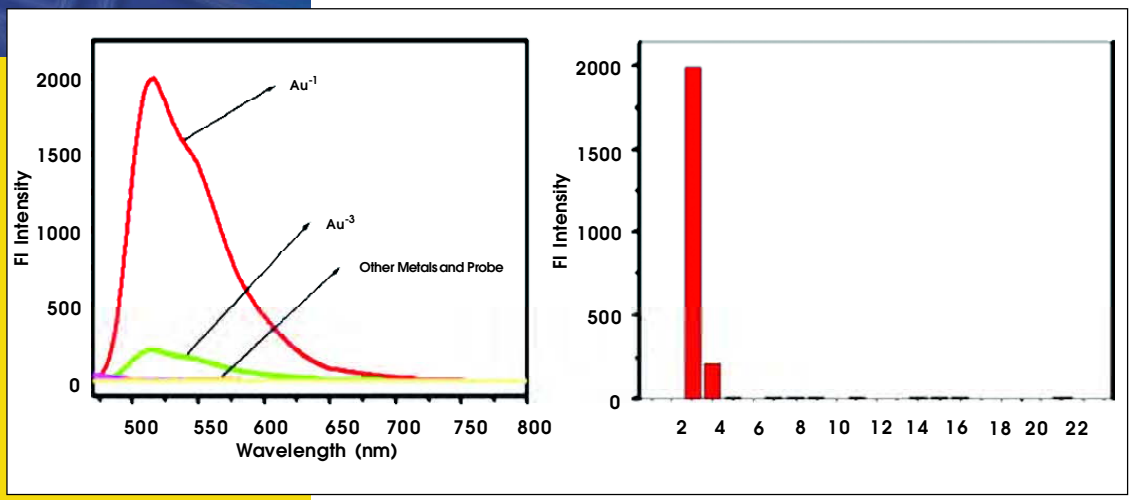

Fig. 5. Fluorescence response of X (10 µM) in the presence of various metals ions (100 µM). Metal ions: 1) probe X, 2) Ag^{1+}, 3) Au^{1+}, 4) Au^{3+}, 5) Ba^{2+}, 6) Fe^{3+}, 7) Bi^{3+}, 8) Hg^{2+}, 9) Ir^{3+}, 10) K^{1+}, 11) La^{3+}, 12) Mn^{2+}, 13) Ni^{2+}, 14) Pd^{2+}, 15) Pt^{2+}, 16) Pt^{4+}, 17) Ru^{3+}, 18) Sc^{3+}, 19) Yb^{3+}, 20) Zn^{2+}, 21) Cd^{2+}, 22) Cr^{3+}

of other metal species is minimal, so this probe can be used as Au^{1+} sensor in presence of other metal species. The fluorescence response of the probe shows excellent linear relationship towards Au^{1+} in the range of 5–80 µM, indicating that the probe can be used for quantitative determination of Au^{1+} (graphs not shown here).

The favourable features of **X** such as fast response, high selectivity, and strong fluorescence under physiological pH encouraged the scientists at IICT to further examine the potential of the sensor for imaging Au^{1+} in living cell. Indeed, the bioimaging studies have also been successfully performed with A549 lung cancer cells and the results indicates the probe **X** can sense Au^{1+} ion in living cells.

In summary, researchers at CSIR-IICT developed a novel approach for detection of gold ions.

The bioimaging studies have also been successfully demonstrated with A549 lung cancer cells. Clearly, further research is necessary to search a novel probe that can detect gold ions at ppm/ppb level. It will also be interesting to see whether it is possible to detect gold content in the earth's crust (oxidized in aqua-regia solution).

CSIR-IHBT Develops Novel Approach for Revegetation of Muck Dumping Sites

About three years ago, in 2010, the National Hydroelectric Power Corporation (NHPC), Faridabad contacted CSIR-IHBT for greening ten dumping sites of their Parbati Hydro Electric Project Stage-II in Kullu district of Himachal Pradesh.

Steep gradient and rocky terrain made the task extremely challenging. Preliminary survey was conducted by CSIR-IHBT to study the landscape for strategizing the planting methodology and selecting suitable tree species. Owing to steep slope of the dumping sites, NHPC created a network of low retaining walls made of stacked stone filled gabions tied together with mild steel wire-net throughout the dumping sites for their stabilization. Thus, the dumping sites were divided into several small grids (Figure 1).

The chemical analysis of surface soil for all the sites was done to assess the nutrient content and pH. Soil of all the sites was

found to be nutritionally poor to support healthy plant growth; hence a novel planting technique was used to ensure maximum survival of plants. Instead of planting directly in the dumping sites, planting was carried out in gunny bags enriched with planting medium prepared by mixing forest soil or garden soil with well decomposed compost or manure and peat moss in a definite ratio (Figure 2).

Gunny bag of dimension 90 cm x 45 cm (lay-flat) was used as planting bag. The consortium of selected plant growth promoting rhizobacteria (PGPR) formulated by CSIR-IHBT was also applied at collar level of the tree saplings either soon after planting in the planting bag or in the hardening nursery before planting them on the site.

In the dumping site, pits of specific size were dug at fixed intervals and gunny bags were fixed in these pits. Sapling of a suitable tree was then planted in the center of each fixed gunny bag. Thereafter, seeds and pelleted seeds of selected shrubs and herbs were broadcast in furrows and in general on surface soil of the dumping site.

Depending on soil and agroclimatic condition of the dumping sites, 11 tree species were selected for plantation along with the shrubs and herbs to form under canopy.

Initially, watering was done every alternate day after plantation. Thereafter, it was carried out as per the weather conditions. All the sites were protected from grazing by fencing. After one year the average survival rate was 85.4%.

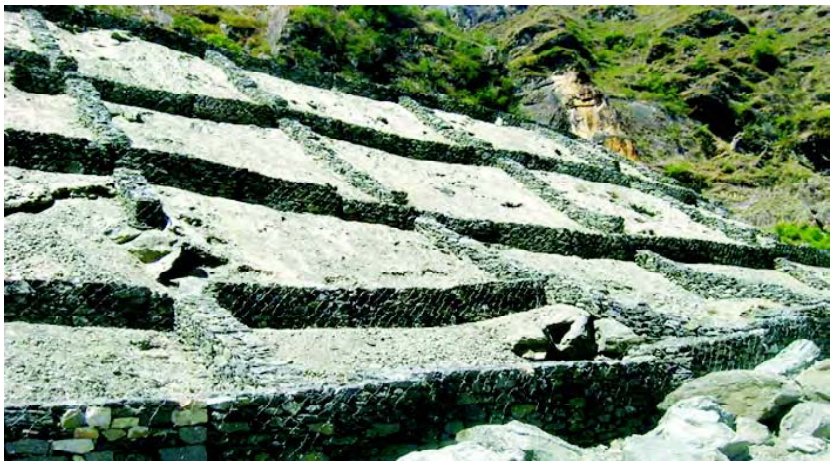

Fig. 1. Grids of dumping site

Fig. 2. Planting of sapling in gunny bag

Fig. 3. Greening of the dumping site

These sites were continuously monitored and infillings were promptly carried out in case of mortality. Two years of hard work and novel approach resulted in successfully greening of barren dumping sites (Figure 3) contributing significantly in ecorestoration.

Enhancing Performance of Materials through Nanotechnology

A set up for the bench scale preparation of silica nanoparticles has been created at CSIR-CBRI. A 1/6 HP motor of 1425 rpm with a stainless steel rotor was fixed on a frame to generate low vibration at high rpm. For the bulk preparation of nanosilica, a plastic container of 60-liter capacity was used (Figure 1).

Fig. 1. Set up for bench scale preparation of silica nanoparticles

Spherical silica nanoparticles with controllable size (<100 nm) were synthesized using sodium silicate as starting material, hydrochloric acid (HCl) as a catalyst and cetyltrimethylammonium bromide (CTAB) as a structure directing agent by sol-gel method. For the silica nanoparticle preparation, first CTAB and HCl were mixed and then 1M sodium silicate solution was added drop wise to the reaction mixture until the pH of system reached ~8.5. The final molar ratio of the reaction system was 0.047:1:0.54 of CTAB: sodiumsilicate:HCl.

Further, these silica nanoparticles were incorporated into the cementitious materials and mechanical properties were evaluated. Four series of fresh cement mortar with varying composition of silica nanoparticles (0.5, 1.0, 2.0, and 3.0%) were cast with moulds (50 x 50 x 50 mm) to prepare specimens keeping water cement ratio (w/c) as 0.4 for the measurement of compressive strength.

The mechanical properties of cement mortar are enhanced by the addition of silica nanoparticles. The compressive strengths after 3, 7 and 28 days are increased substantially on addition of nanosilica (Figure 2). It can be inferred from Figure 2 that early strength is achieved at 3 & 7 days (254 kg/cm^2) on addition of nanosilica as compared to control sample at 28 days (252 kg/cm^2).

Further, chloride permeability of cement mortars was carried out using accelerated chloride migration method i.e. electromigration test. In this method, a glass cell assembly consisting of two-compartments separated by mortar specimen, where one of the cells was filled with 3% NaCl solution and the other cell was with 0.3N NaOH solution as per ASTM C1202, was used. Two platinum electrodes placed on both sides of the specimens served as working electrodes whereas

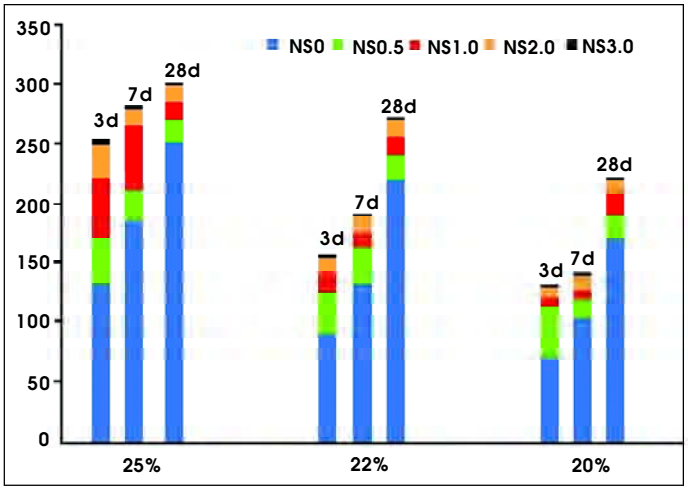

Fig. 2. Compressive strength (kg/cm^2) of cement mortar (i) 25% cement, (ii) 22% cement and (iii) 20% cement with different amounts of silica nanoparticles, respectively

saturated calomel electrode (SCE) placed in analyte worked as reference electrode to monitor the potential applied (Figure 3).

Once the mortar specimen disc, solutions and electrodes were in place, the cells were connected with 7V power source in which the electrode in NaCl solution becomes cathode and the electrode in NaOH solution becomes anode. During the test, small aliquot from destination solution (0.3 NaOH) was taken periodically to measure the free chloride ion concentration in destination solution using UV-VIS spectrophotometer. The incorporation of nanosilica and SF improved the penetration resistance of cement mortar as indicated by the reduction in chloride ion concentration in destination solution. An addition of 3% of nanosilica developed chloride ion resistance in the order of ~43%, as where silica fume was able to reduce by only ~15% (Figure 4). These results signify that the incorporation of nanosilica forms more hydration products and a denser microstructure is developed as compared to silica fume.

In conclusion, large-scale preparation of silica nanoparticles was achieved using sol-gel method with a predefined reaction protocol along with cost-effective ingredients. Prepared silica nanoparticles significantly enhanced the mechanical properties of cement mortar system. Further, silica nanoparticles with 3% addition improved the chloride ion resistance up to ~43%.

L.P. Singh, S.K. Bhattacharyya, S.R. Karade & Team

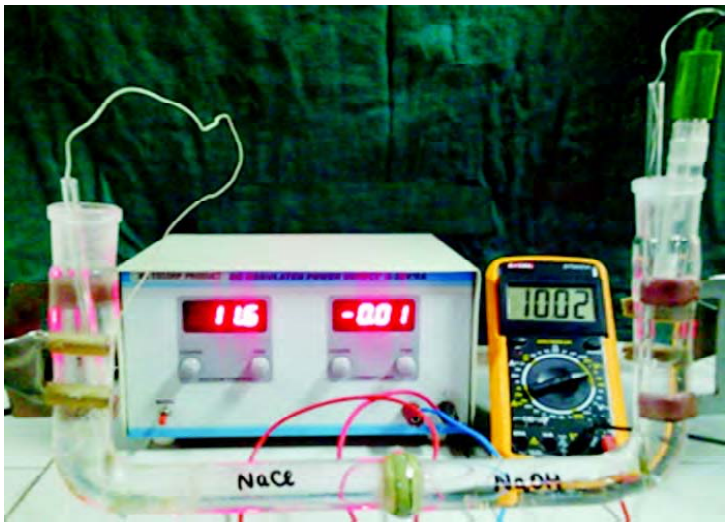

Fig. 3. Experimental set-up for chloride penetration

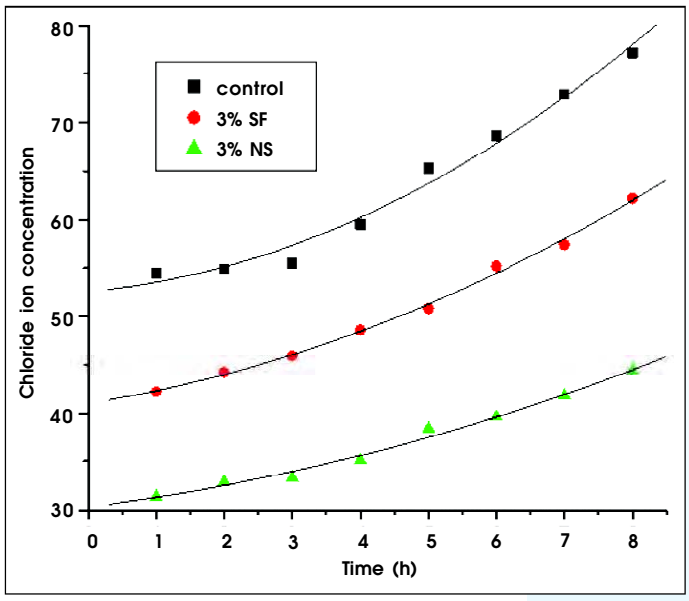

Fig. 4. Chloride ion concentration in anodic cell at 7V

Bio-Concrete as Self Healing Material

Cracks are a common phenomenon in reinforced concrete (RC) structures during their service life due to several reasons. If left unattended, they can cause structural deterioration with high level of risk and maintenance cost in the long term. Currently, cracks are addressed using admixtures such as epoxy resins, epoxy mortar and other synthetic mixtures, which are highly labour intensive and costly. Possible strategies to

deal with cracks in buildings is manual inspection and repair, which is time consuming and not always possible.

A research programme at CSIR-CBRI attempts to develop a smart material *'bio-concrete'*, for arresting cracks using environment friendly biological activity that is a continuous self-remediation process, over and above its economical aspects. 'Bio-concrete' has excellent potential in cementing concrete as well as several other types of structural and nonstructural cracks as a self-healing material.

Extremophiles calcifying bacteria produce urease enzyme which can hydrolysis urea into ammonium and carbon dioxide. The bacterial degradation of urea locally increases the pH and promotes microbial deposition of carbonate as calcium carbonate in a calcium-rich environment. These precipitated crystals can thus fill the cracks and enhance the durability.

The proposed process to generate 'Bio-concrete' by incorporating very specific extremophiles calcifying bacteria is helpful for cementing concrete as a self-healing material. Around 7 % carbon dioxide is produced during manufacture of cement. The less emission of carbon dioxide in the environment would also be possible due to reduced utilization of cement for repair of cracks and enhanced durability.

The following work has been carried out in this regard:

- Collected & isolated alkaliphilic calcifying bacteria from various potential sites & maintained them in the laboratory
- Bacterial cultures were maintained for various experimentations
- Prepared bacteria embedded mortar samples (25x25x25 mm with bacterial broths and with/ without chemical feed) to evaluate their behavior
- Standardized methodology for crack generation
- Study of crack healing capacity on mortar samples is under progress
- Establishment of bio-concrete laboratory has been initiated.

Leena Chaurasia &
Rajesh K. Verma

MoUs

CSIR-IMMT Signs MoU with Gem and Jewelry Institute of Thailand (GIT)

CSIR-Institute of Minerals & Materials Technology (IMMT), Bhubaneswar, and the Gem and Jewelry Institute of Thailand (GIT), Bangkok, signed a memorandum of understanding on 26 November 2013 for cooperation in the area of gemstone characterization and processing.

While Prof. B.K. Mishra, Director, signed the MoU on behalf of CSIR-IMMT, Dr. (Ms.) Pornsawat Wathankul, Director, signed on behalf of GIT, Bangkok. Dr. Chavalit Rojjanaprapayon, Deputy Consul-General (Commercial), Govt. of Thailand, located at Chennai attended the MoU signing function along with a four-member team from GIT and the scientists and staff of IMMT.

GIT is a leading institution not only in Asia but also inf the world. It has made excellent contributions in the field of gem and gemstone characterization, evaluation and certification. It maintains a world class research facility in gem and jewelry and houses an impressive repository of colour gemstones, diamond and pearl collected from all around the globe. GIT is a public organization, under the aegis of the Government of Thailand that promotes gem and jewelry development and technically supports processed gem export from Thailand to western countries like USA, Germany, UK, etc.

IMMT is fairly a new player in the field of gemstone research. The institute has taken up a supra institutional project entitled *'Processing of natural gemstones for aesthetic improvement and value addition'* during the 12th Five Year plan period (2012-2017). The main objective of the project is utilization of the low grade coloured gemstones of Odisha region and improving their aesthetic quality by adopting modern process technologies (heat and laser treatment, ion implantation, irradiation, etc.) so that they become marketable. Significant value addition would take place to the inferior quality raw/natural gemstones available in the western districts of Odisha. Thus, the success of the project could have a major socio-economic impact in the tribal regions of the state.

MoU Signed with GIT, Bangkok, Thailand

As a symbol of commonality of interest, the MoU between IMMT and GIT aims to rope in the strength of each institute in the pursuit of future R&D programmes. Cooperation between the two institutes envisages exchange of researchers, exchange of information and publication in research, implementation of cooperative research, maintenance of confidentiality of information and proposing specific research projects for joint investigation. The memorandum remains effective for two years from the date of signing.

Foundation Day Celebrations

CSIR-CBRI Celebrates its 68th Foundation Day

The 68th CSIR-CBRI Foundation Day 2012 was celebrated with great enthusiasm at the CSIR-Central Building Research Institute, Roorkee on 10 February 2014. The main function was organized in the morning in the institute. Mr. Ajai Chowdhry, Padma Bhushan, Founder-HCL & Chairman, Board of Governors, IIT-Patna graced the occasion as the chief guest and Prof. S.K. Bhattacharyya, Director, CSIR-CBRI presided over the function.

Dignitaries on the dais

In his welcome address, Mr. R.K. Garg, Chief Scientist, Adviser, Group Leader (Efficiency of Buildings) and the chairman of the CSIR-CBRI Foundation Day Committee, presented a brief introduction of the institute, focus areas of R&D activities and detailed the foundation day celebrations in the Institute.

Prof. S.K. Bhattacharyya, Director, CSIR-CBRI addressing the gathering highlighted the glorious past of CSIR-CBRI, which was established on 10 February 1947. Since then it has been contributing to the development of the country by carrying out R&D on all aspects of building and housing, assisting the building industry in solving problems of planning, designing, foundations, materials and construction including disaster mitigation in all kinds of buildings, environment preservation and energy conservation.

Prof. Bhattacharya said that the institute has taken up projects related to conservation of nationally important heritage structures such as the Taj Mahal, Chittaurgarh Fort and Sun Temple at Konark. He spoke about the CSIR-800 project and the role of the institute in upliftment of the life of the poor in the country. He talked about the Integrated M.Tech–Ph.D Programme on "Building Engineering & Disaster Mitigation (BEDM)", which CSIR-CBRI has started under the Academy of Scientific and Innovative Research (AcSIR). He also talked about the major focus areas of R&D, newer areas of research such as sustainability, nanotechnology, bio-concrete and waste utilization in the production of construction materials and products. Recent technology transfers, collaborations and MoUs signed were also highlighted.

Guests, scientists and staff members attending the function

Presentation of Technology Award

Mr. Ajai Chowdhry, Padma Bhushan, Founder-HCL & Chairman, Board of Governors, IIT-Patna appreciated the work done by CBRI. He stressed the need for sustainable development and highlighted the role of the construction industry in the growth of the country and suggested that in the present age of globalization new markets are emerging such as Africa, SAARC countries, etc., where CBRI has a greater role to play in the development process.

The Diamond Jubilee Director's Award for the best research paper published was selected by a High Power Committee and was awarded to the paper entitled *Pine needle/ isocynate composites: Dimensional stability, biological resistance, flammability and thermoacoustic characteristics* authored by Ms. Monika Chauhan, Dr. Manorma Gupta, Dr. B. Singh, Mr. A.K. Singh and Mr. V.K. Gupta.

Diamond Jubilee Director's Award for development of best Technology/ Innovation/Know-how which has maximum impact on the society was awarded to Mr. R.S. Chimote, Chief Scientist, CSIR-CBRI on *Profile of Technology on CSIR-CBRI Liquid Extinguishment Fire Extinguisher for Common Man's Fire Safety.*

On this occasion, a number of CSIR-CBRI publications were released including *CSIR-CBRI at a Glance*' n Hindi as well as in English, *CSIR-CBRI Newsletter*, *Bhavanika* and three Technical Research Publications by the chief guest.

The CBRI Foundation Day Lecture on 'Entrepreneurship' was delivered by Mr. Ajai Chowdhry.

There have been a number of activities organized to celebrate the CSIR-CBRI Foundation Day 2014 including games such as badminton, chess, carom etc.. On 26 January, a friendly cricket match was also organized. A cultural programme was organized in the evening by the staff club and ladies club of the institute. Mrs. Kajal Bhattacharyya, patron of ladies club of the institute, distributed prizes to the participants.

Dignitaries releasing CSIR-CBRI Publications

Lectures

CSIR-CLRI PrIEST Lectures

13th: Tannery Inventory Control Software (TANINCOSOFT)

The 13th PrIEST lecture *Tannery Inventory Control Software (TANINCOSOFT)* was held on 21 September 2013 at the Calcutta Leather Complex, Kolkata. CSIR-CLRI, Indian Leather Technologists' Association (ILTA), Calcutta Leather Complex Tanners' Association (CLCTA), and Indian Leather Products Association (ILPA) jointly organized the lecture.

Dr. Dipankar Chaudhuri, Scientist & Head, RCED (CSIR-CLRI), Kolkata, expressing his views

Shri Misbahul Haque, President of the erstwhile Calcutta City Tanners' Association, Shri Jamil Ahmed, President, Calcutta Leather Manufacturers' Association (CLMA), Shri Shams Tabrez, Past Secretary of CLCTA and many others from the industry and institute attended the lecture.

Dr. Dipankar Chaudhuri, Head, Regional Centre for Extension and Development (CSIR-CLRI), Kolkata in his opening remarks mentioned critical issues like waste reduction, energy efficient processing, process water saving, yield improvement, and leather up gradation, etc., which are of great importance to the industry in this region and pointed out that the PrIEST was designed to assist the industry to address these issues. Expressing happiness over the success achieved so far through PrIEST, he pleaded for extension of the PrIEST beyond 2014 and stressed the need for holding more practical demonstrations under this programme.

Shri S. Nithiyanantha Vasagam, Scientist, Economic Research Division, CSIR-CLRI, Chennai talked about tannery inventory control and showed how a computer-based system can come to the aid of the tanners to manage the stock of various inputs, especially chemical inputs to achieve smooth and trouble-free production. Speaking about the benefits of the system, Shri Vasagam mentioned that it would make the tracing of chemical input easy and provide excellent support to the management for monitoring stock level and placing order for additional supply on time by generating an instant report.

Talking about the software, TANINCOSOFT, developed at CSIR-CLRI for the purpose, Shri Vasagam stated that the software was user-friendly and could be used by multiple users for accessing the same set of data. He also observed that TANINCOSOFT could be configured to run under Windows platform utilizing MS-Access database either on a single PC or in LAN depending on the requirement of the customer. Shri Vasagam went on to explain how this new system could be used to seek data and information that are useful to management and general users.

Mr. Susanta Mallick, General Secretary, ILTA

14th: 'Innovations for Tanning Industry'

The 14th lecture *Innovations for Tanning Industry* was held on 28 November 2013 was delivered by Dr. Duraiswamy Lakshmanan, a former scientist of CSIR-CLRI. Sixty-two persons from various sectors of the leather trade and industry turned up to attend this lecture.

The day's programme commenced with an address from ILTA President, Mr. Arnab Kumar Jha who mentioned tannery pollution as a matter of great concern for the industry and expressed hope that Dr. Lakshmanan's innovations for tanning industry would include some engineering solutions to mitigate the pollution in tanneries. Taking a very broad positive view of the PrIEST, Mr. Jha expressed satisfaction over the technology awareness created through the PrIEST and put forward a proposal of bringing out a compendium of all PrIEST lectures so that the collection could be used by the tanning industry as a ready reference.

Addressing the participants on the occasion, Dr. Dipankar Chaudhuri, Scientist-in-Charge of RCED (CSIR-CLRI), Kolkata presented a brief review of the outcome of the PrIEST and highlighted the technology for turning tannery solid waste into fuel, which CLCTA has chosen for testing in CLC in pilot scale, as one of the most important achievements of the PrIEST. He mentioned the exceedingly long technology life cycle and the consequent slow rate of technology infusion typical for tanning industry, and attributed the apparent low impact of the PrIEST to this. Appreciating the regular industry-institute interaction achieved through PrIEST, Dr. Chaudhuri described it as another achievement of the programme, which no other industry sector in any other part of the country has achieved.

Dr. D. Lakshmanan made a detailed presentation of devices/equipments he developed at CSIR-CLRI, including i) Combo device for flaying, ii) Manually operated tanning drum, iii) Salt separator, iv) Enzyme applicator for skin, v) Low float soaking device-CLaRI processor, and vi) Static Radial Solar Convective Sprinkler for evaporation of reverse osmosis reject. CLaRI processor, enzyme applicator and salt separator appeared to be more relevant to the needs of the industry in this region.

As the name indicates, the salt separator developed by Dr. Lakshmanan removes the adhered salt from the skin/hide thereby reducing the excessive loading of waste soak water with salt. The equipment consists of a perforated hollow lightweight container with baffles fixed in the inner periphery. As the container rotates, the hide/skin inside is lifted up along with the baffles and falls inside the container repeatedly. Due to the rotary-cum-vibratory beating action, the salt sticking on to the hide/skin gets separated and falls through the perforations into a collector fixed underneath the container.

Dr. D. Lakshmanan delivering the lecture

Mr. Patrick Lee of Sheong Shi Tannery in the question-answer session

Enzyme applicator is another development of Dr. Lakshmanan, which promotes cleaner technology in beam house. The main advantage of the enzyme applicator over the manual mode of operation is that it reduces worker contact to the chemical to a minimum level and thereby brings about improvement in workplace health and safety and overall productivity.

Describing the low float soaking device (LFSD) – CLaRI Processor – Dr. Lakshmanan pointed out that in addition to the conventional rotational movement the vessel generates a rocking action, which ensures speedy and effective processing of the substrate without any significant compromise in the quality of the final leather. Elaborating on the important distinguishing features of the device, he mentioned the multi compartmental vessel and its low self-weight, which leads to improved load distribution and consequent saving of significant amount of power. Referring to power transmission arrangement for the system, Dr. Lakshmanan focused on the application of four special rubber rollers that produce little friction and thereby reduce energy loss, and the use of roller chain to arrest the undesirable slip, which is a common problem in the conventional system. He highlighted its compact design, which leads to considerable reduction in its space requirement. Indicating the versatility of the system, he pointed out that the system was perfectly suitable for wet processing in pre-tanning, tanning as well as post-tanning stages.

In his presentation, Dr. Lakshmanan covered many other innovations brought about in tannery engineering. These included a combined device to be used for easy flaying of fallen carcasses in rural areas, tanning drum with a processing capacity of 15–20 kg for manual operation in remote area having no power supply, and improved energy efficient static radial solar convective sprinkler with specially designed sprinkler nozzle for producing solid salt from Reverse Osmosis reject at low cost.

15th: 'Odour Control for Tanneries'

The 15th PrIEST lecture *Odour Control for Tanneries* was held on 16 January 2014 at the Calcutta Leather Complex. Forty-eight persons from various sections of the trade and industry turned up to attend this lecture.

Dr. R. C. Panda, Principal Scientist, CSIR-CLRI, Chennai delivering the lecture titled 'Odour Control for Tanneries'

ILTA President Shri Arnab Kumar Jha in his address identified bad odour as one of the persistent problems of the tanning industry. He felt that any attempt to control the odour in leather industry would be considered praiseworthy. Sharing his own knowledge in odour control, he told the participants that he was aware of leather chemical formulation incorporating pleasant smelling compounds. He added that the external addition of such compounds was very common in this industry for turning a malodorous emission into an acceptable one.

Dr. Dipankar Chaudhuri, Scientist and Head, RCED (CSIR-CLRI), Kolkata announced that the programme would come to an end with the holding of two more events – one lecture and one demonstration. He appreciated the PrIEST highly for laying a solid foundation of technology awareness, which the CLC tanners needed for carrying out trial and practice of cleaner technologies. He lauded the broadened horizon of the CLC tanners with regard to sustainable technology and attributed this improvement to the PrIEST. Expressing the need for

continuing the technology awareness/ sensitization programme for CLC tanners, Dr. Chaudhuri opined strongly in favour of beginning the second edition of PrIEST to initiate and sustain the cleaner technology practice. Presenting a not-so-encouraging picture of the current status of cleaner processing in CLC, Dr. Chaudhuri cautioned the tanners against remaining indecisive in this regard as this might give them very little time at the critical juncture to make the right choice.

Dr. R.C. Panda, the day's main speaker, began his lecture with a brief background of the process control measures recommended for tannery. He presented the odour control system as an integral part of the process control exercise to be made for a tannery wet yard. Although odour may be composed of several gaseous compounds, ammonia and hydrogen sulphide were the primary target of Dr. Panda's odour control system as they are the two principal toxic gases, which are emitted from the tannery wet yard. Dr. Panda pointed out that a number of techniques are available for managing odour. They include scrubbing, adsorption, incineration, oxidation and masking.

Taking a broader view of various technologies available for odour control, Dr. Panda classified them into three groups: a) chemical scrubbing, b) dry media (activated carbon) adsorption and c) biological scrubbing (bio-filter) based on the process adopted for treatment. However, irrespective of the technology selected for treatment of odour, a venting system has to be put in place to carry the odourous gas to the treatment point. The venting arrangement, which is common to all systems, will consist of hood, fan/blower and duct work.

At treatment point, the system will be different depending on the methodology adopted. For instance, while chemical scrubbing technology will require chemical storage tanks, dosing system and control panel, biological scrubbing technology will need a bio-filter and an arrangement for maintaining the bio-film in an active state. A bio-filter is made up of a packaging material which holds a thin film of selective microorganisms on its surface so that when the system brings the odourous gases in contact with the film, the microbes act on them and degrade them into non-odourous compounds. Unlike the chemical scrubbing or dry media adsorption, this system brings about biological degradation of odourous compounds at the expense of little additional chemical and energy. However, in order to keep the bio-film active, it has to be maintained at temperature and relative humidity suitable for the survival and growth of microbes present in the film.

Dr. Panda explained the merits and demerits of each group of technology used for odour management and observed that the final choice of technology depends on a number of factors like gas mixture composition, inlet load variation, space requirement, and generation of effluent apart from initial investment, and operation & maintenance cost. However, being environmentally friendly in nature, bio-filter offers a unique advantage over other odour control systems. And because of its advantageous environmental performance and low cost, Dr. Panda chose this technology to develop a prototype of an odour control plant for a commercial tannery in Chennai.

Dr. Panda designed the ventilation duct system and bio-filter used for this purpose and developed a model to simulate the process that occurs in the bio-filter. While both pilot-scale and full-scale data were used to verify the model, the latter provided an opportunity to do a cost-benefit analysis as well. Dr. Panda then presented the cost-benefit analysis, which showed that with the prototype developed by him a removal efficiency of 96% could be achieved at an installation cost of rupees nine lakhs for de-odourizing six wet drums, which is equivalent to 1000 square meter of drum yard. Dr. Panda showed that the total monthly operation and maintenance cost for the system was merely Rs. 570.

Dr. Panda said that a tannery or any other unit which has some odour related issues and is eager to use this technology for odour removal can take his module from CSIR-CLRI and get some financial incentive from the Govt. of India.

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In the interaction session, Shri Susanta Mallick, Hon. General Secretary, ILTA asked the speaker to suggest some measures to control odour in tanneries. Dr. Panda said that treatment and dilution/dispersion were the only two options available for managing odorous gas emission. Shri Mallick added that some elementary in-house measures including good housekeeping practice would be very effective in arresting the generation of odorous gas in the first place. Shri Mallick appealed to the tanneries to take special care to keep the sewer lines and tannery premises clean/unclogged.

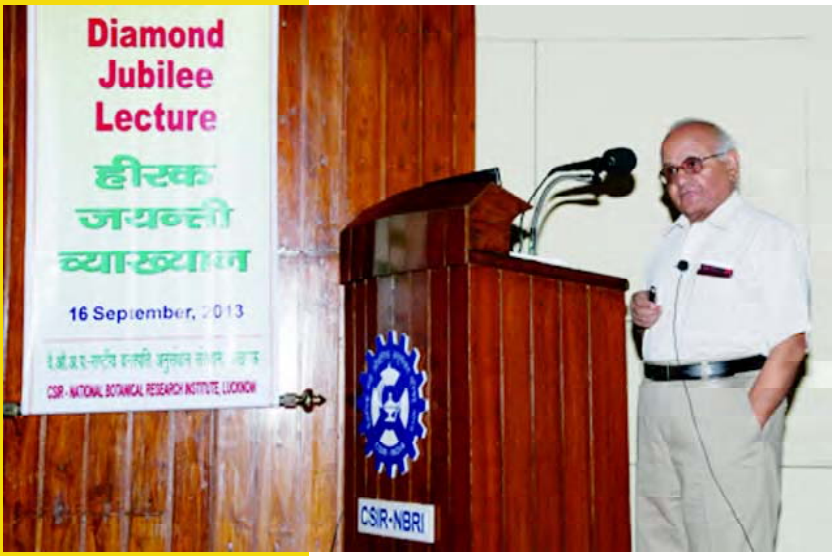
Shri Kunal Naskar of Vinith Gloves Manufacturing Pvt. Ltd. said that the waste water collection tank in his tannery emitted a lot of hydrogen sulphide gas. He wanted to know from Dr. Panda if bio-filter technology could be applied to collection tank as well. Dr. Panda responded in the affirmative. He said that a suitable ventilation duct system would have to be designed for the purpose.

Dr. Chaudhuri, Head, RCED (CSIR-CLRI) added that it would be highly profitable to reduce the emission of hydrogen sulphide gas from the collection tank. He felt that the programmed discharge of waste water into the collection tank to avoid mixing of acidic waste liquor with waste lime liquor would be beneficial in this regard. He also suggested Shri Naskar to run continuously the propeller/aerator installed in the collection tank to avoid the development of anaerobic conditions, which lead to hydrogen sulphide gas generation in his collection tank.

Diamond Jubilee Lectures at CSIR-NBRI

In the series of Diamond Jubilee Lectures at CSIR-National Botanical Research Institute, Lucknow, two lectures were held on 16 September and 27 September 2013.

Prof. P.K. Gupta, Hon. Emeritus Professor, Ch. Charan Singh University, Meerut, delivered a lecture entitled, *Molecular Breeding as an Essential Component of Conventional Plant Breeding* on 16 September 2013.



Dr. P.K. Gupta delivering the lecture

In his talk, Prof. P.K. Gupta said that crop breeding, involving use of molecular markers, has emerged as a new approach of plant breeding to supplement the conventional methods of plant breeding. The approach involves the use of molecular markers associated with important agronomic traits for selection of desirable plants in the segregating generations. This is particularly desirable for traits for which selection through conventional methods of plant breeding is either difficult or cost/time ineffective.

Marker Assisted Association (MAA) poses problems especially in case of complex traits/QTLs like grain yield, abiotic yield which are polygenic, low inheritability, with genetic interactions among themselves. Outlining the various approaches for marker assisted selection, he said that these approaches have gained significance in recent years due to the realization that improvement of traits like water-use efficiency and nutrient use efficiency (NUE) along with tolerance to a number of other abiotic/biotic stresses would be necessary to augment the

productivity of all major food crops, as is required to meet the future demands of food and nutritional security.

Quoting some examples of successful use of marker assisted selection in plant breeding, Prof. Gupta said that efforts in marker assisted selection in India are being done by various institutions e.g. transferring a major QTL for salt tolerance (Saltol) to Pusa Basmati 1121 by IARI, which is widely grown in Haryana, the state having problem of salinity owing to underground brackish water, Birsa Vikas Dhan 11, a drought tolerant rice variety for East India, and Swarna-Sub1A, a flood resistant variety of rice.

In case of wheat, more than dozen varieties have been developed through molecular breeding approaches. Marker Assisted Recurrent Selection (MARS) and Genomic Selection (GS) approaches are recent methods successfully employed in western countries but have not been exploited in India except in a few institutions like IARI and ICRISAT, Dr Gupta informed. Genomic selection approaches have been found to be successful in animal breeding but not in plants. Genotyping by sequencing approach and *in silico* studies are some of the models employed in Genomic selection approaches which are yet to be implemented in India, he said.

In the Diamond Jubilee Lecture held on 27 September 2013, Dr. T.S. Balganesh, Distinguished Scientist, Open Source Drug Discovery Unit (CSIR), IISc, Bangalore delivered a lecture entitled, *The two cultures – building synergy between academic and industry research*.

Dr. Balganesh said that the challenge of success in a multidisciplinary effort like drug discovery is the ability to work, appreciate and respect scientific expertise across different domains. Based on his own experience at AstraZeneca, Bangalore, he spoke on how integration of the two cultures of academic and industrial research was able to deliver the clinical candidates for treatment of Tuberculosis.

Elaborating further, he said that TB is not only a neglected disease but a complex one with lack of biomarkers, complex clinical trials, etc. As per WHO, one third population of the world is infected with TB, and in India

Dr. T.S. Balganesh delivering the lecture

6% are infected with TB, he informed. He said that pharmaceutical companies don't work generally for such diseases due to lack of return of investment. We have very few drugs for TB as compared to HIV which has 25 drugs in the market in the last 25 years, he remarked. He said that we are morally responsible for finding a solution for eradicating this disease as two deaths occur every three minutes in India due to TB.

Dr. Balganesh remarked that drug discovery is capital intensive and it takes more than two decades to develop a successful drug. A paradigm shift towards healthcare especially in finding a cure for neglected diseases can not only increase the rate of success but reduce time and cost at least ten-fold in development of drug. The Open Source Drug Discovery (OSDD) model which operates on an open innovation model is a viable approach as it pools the efforts of many independent research ideas and data which are integrated to find a solution to the problem, he said. It provides a platform for independent researchers to access technologies that are readily available to them.

Dr. Balganesh said that the challenge of success in a multidisciplinary effort like drug discovery is the ability to work, appreciate and respect scientific expertise across different domains.

Prof. Andrea Vasella delivers B.D. Tilak Memorial Lecture at CSIR-NCL

CSIR- National Chemical Laboratory (CSIR-NCL), Pune organized the Prof. B.D. Tilak Memorial Lecture on 24 October 2013. This was the eighth lecture in the series and was rendered by Professor Andrea Vasella of Laboratorium für Organische Chemie, Zürich, Switzerland. The lecture was organised under the auspices of The NCL Research Foundation.

Prof. Andrea Vasella delivering the talk

Prof. Andrea Vasella spoke on Glycosidase inhibitors: the case of retaining β-D-Glycopyranosidase. He said that Chemistry should solve the problems and as a chemist we should work hard to find the problems and to solve them. He talked all about glycosidase and glycosidase inhibitors. These are the enzymes that are involved in the processing of oligosaccharides of biological significance. Glycosidase inhibitors play an important role in drugs to control the metabolic diseases. Currently there are a number of drugs in clinical use, for example drugs for cancer, for viral infections including HIV and influenza, for lysosomal storage diseases and for diabetes which belong to the class of glycosidase inhibitors.

Prof. Vasella provided a comprehensive summary of the research spanning over two decades in his group that has led to the discovery of new aspects pertaining to the mechanism and a new classification system, purely based on how the catalytic machinery of these enzymes operate during the glycan hydrolysis. The major part of Prof. Vasella's talk was focused on the design and kinetic characterization of transition state analogues, mostly mono- and disaccharides possessing new structural motifs. He discussed his synthetic strategies and different reaction mechanisms to reach to the aimed product.

Prof. Vasella also described how his group arrived at the classification of the compounds as syn- or anti-protonating glycosidases, which was supported by the analysis of the available glycosidase X-ray crystal structures. Prof. Vasella exclaimed that chemistry is the kingdom of the reasons and we should always keep the tendency to follow them up. Finally, he advised the students to understand the language of chemistry and to believe in the specialization.

Earlier, Dr. Sourav Pal, Director, CSIR-NCL, in his welcome remarks remembered Prof. B.D. Tilak as an eminent organic chemist. Prof. Tilak as the director of CSIR-NCL during 1966-1978 re-oriented CSIR-NCL's research towards industry. He contributed significantly to chemical technologies in textiles and dye industries. He worked for the innovation and empowerment of rural technologies.

Dr. C.V. Ramana formally introduced Prof. Andrea Vasella to the audience. Prof. Vasella had worked on his independent theories of carbohydrates and straits of DNA and RNA. He is the recipient of many awards including Werner medal and Roy L. Whistler Award.

Asia Pacific Meeting of Glass and Allied Industries & International Commission on Glass Steering Committee Meeting at CSIR-CGCRI

CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata, the International Commission on Glass (ICG), All India Glass Manufacturer's Federation (AIGMF), and the Indian Ceramic Society (InCerS) jointly organized the Asia Pacific Meeting of Glass and Allied Industries during 2-3 December 2013.

The Steering Committee Meeting of the International Commission on Glass (ICG), which is an international glass society comprising of 37 national organizations in glass science and technology, was also simultaneously held at CSIR-CGCRI.

Sponsors of the events included Henan Zhongyuan Special Refractory Co Ltd., China; Zhengzhou Huite refractory Material Limited Company, China; Borosil Glass Works Ltd., Mumbai; H&R Johnson Ltd., Mumbai; La Opala RG Ltd., Kolkata; Hopewell tableware Pvt. Ltd., Jaipur; Hindusthan National Glass and Industries Ltd., Kolkata; All India Glass Manufacturer's Federation, New Delhi and CSIR- Central Glass and Ceramic Research Institute, Kolkata.

The objective of the Asia Pacific Meeting of Glass and Allied Industries was to energize glass and allied industries in the Asia-Pacific countries and also in India so that future policy guidelines may be provided for the growth of glass industries and new direction for research in the field.

The aim was also to catalyze participative science and technology development in the domain of glass and allied science. Another endeavour was to develop knowledge to business (K2B) interface for increasing competitiveness of the Asia-Pacific Glass Industry and to encourage regional cooperation in the field.

Glass Person of the Year, Phoenix Award winner Shri C.K. Somany, and Chairman, Hindusthan National Glass and Industries Ltd. (HNGIL) was the Chief Guest. Dr. S. Kumar Former Director, CSIR-CGCRI was the Guest of Honour.

Prominent amongst the delegates present on the occasion were Prof. Peng Shou, President, ICG; Dr. Fabiano Nicoletti, Honorary President, ICG; Dr. Sener Oktik, Sisecam A.S.; Dr. Manoj Choudhary, Owens Corning, USA and Vice President, ICG; Dr. Arup K. Chattopadhyay, President, InCerS; Dr. H.S. Maiti, Former Director, CSIR-CGCRI and Prof. I. Manna, Director, IIT, Kanpur and Former Director, CSIR-CGCRI.

The luminaries representing the Indian Glass Industry included Shri P. Kherurka, Vice Chairman, Borosil Glass Works Ltd, India; Shri C.V. Chalam, Tech. Advisor, Ceasan Glass; Shri. Swapan Guha, MD, Hopewell Tableware; Shri Sudipta Saha, Vice President, H. R. Johnson India; Shri Mukul Somany, Vice Chairman and MD, HNGIL; and Shri Arun Kumar, President, AGI GLASPAC.

Acting Director, Shri Kamal Dasgupta warmly welcomed all delegates to the City of Joy. Very briefly he introduced the delegates to the multifarious activities of CSIR-CGCRI. He highlighted its commendable service to the nation in both civil-societal and strategic sectors. He expressed appreciation of the roles played by the ICG, InCerS, Industry, Academia and scientific peers abroad in meeting goals of mutual interest.

Prof. Peng Shou in his pithy address reiterated that India has a large number of glass industries and that it was important for ICG. He was confident that the interactions at the Conference would have positive outcomes for the glass and allied industries.

Dr. Fabiano Nicoletti expressed his

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happiness about his visit to India and his meeting with friends and colleagues; young and old. He acknowledged the connection between ICG and India which went to the 1980s and rued the brief lull in between and announced his delight that firm ties had been re-established. Dr. Nicoletti emphatically pronounced that the winds of change were blowing and that it would have a great influence on the future of glass.

Dr. Arup K. Chattopadhyay said that it was good news that the Steering Committee Meeting of the ICG was being held at CSIR-CGCRI, India. He noted that the present climate is one of inter-dependence and for better or for worse we are dependent on each other. He listed three global challenges that need to be pondered over. These were: Inequality with poverty stalking millions across the globe; Instability in large parts of the world and Sustainability. He said that unless these three issues were addressed, growth was impossible. Special care was needed to address the issue of sustainability, not just because there is approximately 23 per cent gap between energy production and use but because of the energy crunch which is of significance to the glass industry since it uses energy intensive processes. Efficient energy processes have to be worked out to reduce energy guzzling in the present scenario and also to leave enough for future generations. He said that technology should be used to bridge inequality and thinking green in the context of energy would lead to upliftment. He spoke about the need for affordable healthcare because only healthy communities prosper. The fight for the future is now, he concluded.

In his address, Guest of Honour, Dr. S. Kumar said that the last few decades had seen sharp increase in industrial activities in Asia-Pacific countries especially in China, Japan, and Korea. He discussed the problems specific to the glass and allied industries amongst which he paid particular attention to resource crunch, escalating fuel demands, pollution, emissions of Lead, Iron etc., from glass melting, leaching of Chromium and Selenium etc. He touched upon the initial years of close interaction with the ICG and expressed satisfaction that the ties had been re-established. He was confident that CSIR-CGCRI was competent to participate in the various committees of the ICG and to have meaningful discussions in areas of cooperation.

Speaking on the occasion, Shri C.K. Somany outlined the history of glassworks in India. He spoke proudly about Ishwar Das Varshney, a pioneer of the Glass Industry in India who, in 1908, with the help of Bal Gangadhar Tilak, had set up the Paisa Fund Glass Works in Talegaon near Pune by collecting only one paisa donation from every person. Container glass industry was initiated in around 1952 and the glass industry has gone from strength to strength since then. The reason why glass is so popular is because of its versatility in usage for a wide range of products. It finds applications in diverse areas such as aesthetically designed artwork to construction business. Transparent glass is revolutionising modern architecture. It lets in light and cuts down on the cost of energy used for artificial illumination. It is eco-friendly because it can be infinitely recycled. It is inert and thus an excellent packaging medium particularly for food, beverages and pharmaceutical products. Shri Somany said that the glass industry has to be future-ready to cope with the challenges and opportunities.

Prof. I. Manna chaired the first Technical Session. In his Opening Remarks he said that it used to be said that the growth of a country could be assessed from the quantum of its steel production but that the time has come when glass production in a country could be a measure of its growth. He said that it was important for India to make a mark in glass and allied industries and that it was not possible to get a better venue, than the current one, in the entire subcontinent. He said that CSIR is considered the mother of almost all of India's many scientific organizations and that CSIR-CGCRI is the only such institute in the subcontinent.

CSIR-CGCRI began from scratch, he said, and is now a significant contributor to the measure of self-sufficiency achieved by the nation in the strategic sector. It was a conscious decision to acquire expertise in the area of specialty glasses and not venture too much into float or container glass. The

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challenge is to maintain the continuity of excellent work done in service to the nation. He touched briefly upon the legacy of this institute by remembering the contributions of Dr. Atmaram, a prominent glass scientist, the first Director of CSIR-CGCRI, and also a former Director General of CSIR. Dr. Atmaram did seminal work on coloured glass and import substitution. The resultant glass not only rejuvenated the domestic bangle industry but is still being used by Indian Railways for signalling. He ended by saying that India must leverage the best advantage it has: youth. The young must be empowered and knowledge must be created and young students must reciprocate by seizing the opportunity represented by the Academy of Scientific & Innovative Research (AcSIR).

Dr. Manoj Chaudhary gave an overview of the ICG and the US Glass Industry. He said that the first ICG Congress on Glass was held at Venice in September 1933; 200 participants from 8 countries participated and 42 papers were published. The ICG constitution was finalized at this event. The ICG has four objectives: (i) Cooperation/ participation, (ii) Clearing house for technical and scientific works for future congresses, (iii) Receipt/transmission of topics of international interest on Physics, Chemistry and Technology of glass and finally, (iv) Assistance to those countries that still do not have glass-related societies. He said that most of the work of the ICG was carried out by its Technical Committees (TCs), which are the "backbone" of international cooperation clusters. The TCs are organized into groups according to their R&D activity fields and include: Basics, Glass Production, Surfaces & Interfaces, New Applications and Information, Communication, Education, History. He then presented details about the TCs.

Glass is a vital part of the US manufacturing base and represents almost $ 30 billion/year of value. In summation, he said that USA and Europe, in particular Germany, dominate the global glass scenario. US accounts for about 29 per cent of global glass production although foreign-owned companies have a significant presence here. Glass manufacturing is expected to grow by 2 per cent every year for the next 4-5 years. China has already registered its presence, albeit as a small and growing one. However, India needs to show up more to make a mark internationally.

Dr. Arup K. Chattopadhyay delivered a talk entitled *Refractories for Glass Industry*. He analyzed the world market trend for refractories for glass industries and said that while there was a declining trend for specific refractory consumption, there was a definite upswing in the demand for total refractory solutions. He added that conventional products are losing ground but there is increased demand for customer-driven product design. India represents one of the largest markets and manufacturing capacities of glass products in Asian region, after China.

Firozabad in Uttar Pradesh meets about a third of India's glass needs. He then discussed the new generation refractories for the glass industries. He said that sophisticated refractories are needed for glass furnaces. He concluded by saying that the Glass Industry is facing challenges, the most important of which are: enhancement of furnace life, increase in productivity, achieving better energy efficiency and environmental protection. Refractory industry needs to accelerate the pace of development of technology and product quality. He called for closer ties between the refractory industry and technology providers to render complete refractory solutions for the Glass Industry.

Technical Session II was chaired by Shri C.V. Chalam, Tech. Advisor, Ceasan Glass. Shri Swapan Guha, MD, Hopewell Tableware Pvt. Ltd., Jaipur spoke about *Ceramics and Glass Tableware*. He gave a comprehensive picture about the pioneering companies that had produced tableware in India; leading names included Bengal Pottery, Parashuram Pottery and Hitkari Pottery. Later came Bharat Pottery Pvt. Ltd., Clay Craft Pvt. Ltd., Jaipur Galss and Potteries, Jaipur Ceramics Pvt. Ltd and Oasis Ceramics and Khurja Pottery among others. It was not till 1976 that Nalanda Ceramics initiated manufacture of porcelain tableware with Japanese collaboration, but the project was not very successful. Similar was the case with Bharat Potteries Ltd.

The Glass Industry is facing challenges, the most important of which are: enhancement of furnace life, increase in productivity, achieving better energy efficiency and environmental protection. Refractory industry needs to accelerate the pace of development of technology and product quality.

Interestingly, while this was the case in India, Bangladesh and Sri Lanka were forging ahead quite successfully perhaps because they are rich in natural gas—a pre-requisite. Another constraint that India faces is the non-availability of quality raw materials.

In India, opal tableware was introduced by La Opala about 25 years ago. Then came Diplomat, Vicopal, and Alembic Glass; Hopewell tableware joined the fray in 2011. Opal tableware is expected to grow at a rate of 12-15 per cent annually in the next five years. Lack of quality raw material necessities the import from countries such as Turkey, New Zealand and China. Currently, India holds second position after China in the production of bone china. India's capacity for producing bone china table ware is 200 MTPD of which 25 per cent is exported. Indian manufacturers have captured a large chunk of the big mug business none has been really successful in producing internationally celebrated quality bone china dinnerware.

Mr Sudipta Saha, Vice President, H.R. Johnson, India spoke about Glass Frits for Ceramic Glazed Tiles and their Applications. He began his talk by enumerating the different types of tiles that are made and said that without good quality frits it would not have been possible to create this diversity and to achieve the levels of excellence that is available in the tile-market. He especially mentioned the CSIR-CGCRI created glass frits/beads that have been approved by NRB/DAE (Mumbai).

Dr. G.P. Kothiyal, former Senior Scientist BARC, elaborated further on *Glasses and Glass-Ceramics for Sealants and Nuclear Waste.*

Dr. Fabiano Nicoletti chaired Technical Session III. Shri Mukul Somany spoke on *Evolution of Glass Industry in India: Challenges and Future Scenario.* He began with an overview of the Indian glass industry which has roots going back to Harappa and Mohenjodaro (Indus Valley civilization) via trade with ancient Sumer in Mesopotamia. There is evidence that Firozabad, India's Glass City, was producing glass by the 17th century. The first Indian glass factory was set up in 1908. The quantum leap in the business of glass making really happened only in 1958 when the float-glass process was perfected in 1958. It rapidly became a significant industrial innovation and became the method of choice globally for making flat glass for buildings and vehicles. India adopted it too even as India produced its own indigenous technology to make bangles. He then elaborated about the market share of the different types of glass and the specific challenges faced by the Industry in these sectors, potential avenues for future revival and most importantly, expectations from CSIR-CGCRI and the scientific community.

Former Director, Dr. H.S. Maiti who chaired the Joint Meeting of ICG, AIGMF and delegates made a brief speech on India's association with the ICG following which there was a spirited discussion amongst all present. Excellent debate on the capabilities of all the organizations took place and all delegates felt that closer interaction is needed. Outcome of the ICG, AIGMF Joint Meeting was that a few research areas were identified. These include modelling and simulation of glass melting and glass forming processes. Some experts emphasized on the need for research on soft and light glass for container applications. They stressed on research on energy-efficient float glass for structural and habitat applications.

Dr. Manoj Choudhary chaired Technical Session IV. Shri C.V. Chalam shared his enormous personal experience in the Glass Industry starting from the 1950s to the present. He said that India now manufactures almost all types of glass to global standards.

Dr. Sener Oktik presented an overview of the Turkish Glass Industry beginning with the glassware of the Seljuk and Ottoman periods. In 1934, the foundations of *Turkiye Sise ve Cam Fabrikalari A S* were laid. It was Turkey's first national glass factory. In 2012, it accounted for about 90 per cent of Turkey's glass production. He said that the Eurozone catered to 70 per cent of Turkey's export.

In a fitting finale, Dr. Ranjan Sen gave a crisp and focused description of the activities of CSIR-CGCRI in the field of specialty glasses. He sent a clear message that while specialty glasses were not manufactured in bulk like, for example, container or float glasses, these have their own importance for the nation's social and

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strategic sectors, the indigenous technology for radiation shielding glass that allows the creation of a transparent medium capable of shielding operators from harmful radiations being a case in point. He also elaborated on the applications of fiber optics oriented research in the area of specialty fibers and fiber-based devices. Finally, he added that not only was CSIR-CGCRI a research organization equally involved in basic as well as applied science, it had also demonstrated its commitment to the next generation of students and future scientists by having a functional AcSIR curriculum.

These sessions were followed by Business session, Panel discussion and Cultural programme. In addition, The ICG Steering Committee meeting, AIGMF Executive Council meeting on the sidelines also took place.

Dr. Sukanya Datta, Scientist,
CSIR-CGCRI

Appointments

Prof. Tripathi Appointed Director, CSIR-CIMAP

Professor Anil Kumar Tripathi, School of Biotechnology, Faculty of Science, Banaras Hindu University (BHU) took over as Director of the CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP) on 17 February 2014.

Prof. Tripathi has made notable contributions by identifying and characterizing nitrogen-fixing bacteria which support the growth of important grasses that inhabit desiccating desert (Sewan grass or *Lasiurus sindicus*) or grow under submerged conditions in lakes and ponds (deep water rice) using cultivation-dependent and cultivation independent molecular techniques. He was also the first from India to show the occurrence of *Ralstonia* (renamed as *Cupriavidus*, a β-rhizobium) as microsymbiont colonizing the legume nodules (*Mimosa pudica* and other species).

He has also identified several novel salt-stress-induced genes and promoters in *A. brasilense*. Using 16S rDNA-based cultivation-independent methods, he identified, for the first time, the microbes associated with methanogenesis in an Indian coalbed. His current researches are focussed on understanding the systems biology of *A. brasilense* for its synthetic biology towards efficient carbon sequestration, and for developing *A. brasilense* mutants as microbial cell factory for producing secondary metabolites of pharmaceutical importance.

Prof. Tripathi is the winner of Career Award, University Grants Commission, New Delhi (1994-1997) and Young Scientist Award, Indian Science Congress Association, Bangalore (1987). He is a Fellow of *The National Academy of Sciences*, India (FNASc), Allahabad, 2012, *National Academy of Agricultural Sciences*, (FNAAS), New Delhi, 2009, *Association of Microbiologists, India* (FAMI), New Delhi, 2006 and *Biotech Research Society,* India (BRSI) Trivandrum, 2005.

He was Chairman, Board of Studies, School of Biotechnology, BHU, and Chairman, Board of Studies in Biotechnology, Rajiv Gandhi Technical University, Bhopal. He is also Member of the Task Force on Biodiversity Conservation and Environmental Biotechnology, Department of Biotechnology, Government of India.

Prof. Tripathi has published 64 research papers in peer-reviewed journals besides writing 12 reviews/chapters/books and filing a patent.

फार्म 4/FORM IV
(नियम 8 देखिए/See Rule 8)

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6 उन व्यक्तियों के नाम व पते जो समाचार-पत्र के स्वामी हों तथा जो समस्त पूंजी के एक प्रतिशत से अधिक के सांझेदार या हिस्सेदार हों

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मैं ---------- एतद् द्वारा घोषित करता हूं कि मेरी अधिकतम जानकारी एवं विश्वास के अनुसार ऊपर दिए गए विवरण सत्य हैं.

I, Deeksha Bist, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/- Deeksha Bist

Dated 15 March 2014 — प्रकाशक के हस्ताक्षर/Signature of Publisher

Honours & Awards

CSIR-NIIST Scientist wins *YIM Boston Young Scientist Award*

Dr. C.H. Suresh of the chemical sciences and technology division of CSIR-National Institute for Interdisciplinary Sciences and Technology, Thiruvananthapuram, has won the 'YIM-Boston Young Scientist Award.' The award has been instituted by YIM (Young Investigator Meeting)-Boston for honouring outstanding achievements in science and technology by young scientists in India.

Dr. Suresh has been nominated for his year's award based on his accomplishments in the field of applied theoretical chemistry, the jury said. His contributions through more than 100 peer reviewed research articles in this field of research have allowed to predict new functional molecules and also to predict the outcome of a reaction.

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