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# CSIR News

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## In The News

### Dr. Harsh Vardhan calls upon CSIR Laboratories to Catalyse India's Evolution into Samarth Bharat-Sashakt Bharat



The Union Minister for Science & Technology and Earth Sciences, Dr. Harsh Vardhan making his opening remarks at the two day Director's Conference, at CSIR-IIP, Dehradun

**A**T a two-day 'Chintan Shivir' held on 12th and 13th June 2015 at the CSIR-Indian Institute of Petroleum in Dehradun, all CSIR labs agreed to make efforts to be self-financing in the next two years. The two-day brainstorming session of CSIR Directors also adopted the 'Dehradun Declaration' where Directors of CSIR labs resolved that technologies will be developed for national missions like Swachh Bharat, Swasth Bharat, Skill India, Smart Cities, Digital India, and Namami Ganga.

At the meeting attended by Director-General CSIR and all the CSIR Directors,

the laboratory heads made presentations about their respective lab achievements in transferring products and processes to industry. They also listed the patents awarded, skill development programmes carried out, socio-economic interventions made, villages adopted and upgraded and contributions to government programmes. The successes in realizing Royalties and License Fee receipts were also shared with projections made for the next year.

The two-day conference also resolved that CSIR laboratories would devise ways to develop industry-driven technologies,

including game-changing technologies. Each laboratory would also develop at least one technology in strategic sector for India. The resolution also declares that all CSIR Institutions will make preparations for Platinum Jubilee celebrations of the Council of Scientific and Industrial Research beginning September 2016.

In his concluding remarks the Union Minister for Science & Technology and Earth Sciences Dr. Harsh Vardhan said that CSIR should be a catalytic agent to evolve India into Samarth Bharat-Sashakt Bharat. The Minister urged CSIR to develop a revenue model in a businesslike manner with clear input-output cost analysis. Emphasis should be laid on achieving global standards and to build confidence in the society about relevance of CSIR labs in terms of social benefits, he said. Dr. Harsh Vardhan also called upon the Labs to endeavour to build up entrepreneurship in Small, Medium and

Big industries. He also said that CSIR should focus on developing technologies for improving the quality of life of the common man.

The Union Minister of State for Science & Technology and Earth Sciences Shri Y.S. Chowdary urged all the CSIR directors to come up with at least 12 cutting-edge technologies which could be commercialized every year.

The “Make in India” and “Innovate in India” visions of the Prime Minister came up for special focus at the two-day meeting and saw all CSIR heads accept the challenge to provide the Science & Technology research findings as backbone to a great and new manufacturing economy.

Dr. Harsh Vardhan said, “I have full confidence in our scientists. With proper encouragement and focused approach, I am sure India will achieve the status of the world’s greatest scientific powerhouse.”

## CSIR-CIMAP Announces Success in Sequencing ‘Tulsi’ Plant Genome

Scientists from the CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow have successfully sequenced the genome of the tulsi plant, *Ocimum tenuiflorum*, also known as *Ocimum sanctum*, and holy basil. This is the first report of complete genome sequence of a medicinal plant of India, using composite next generation sequencing technologies.

The successful sequencing opens up avenues to further investigating the medicinal properties of the tulsi plant, its leaves and also seeds. The plant has been in use in Ayurveda and even other traditional methods of medicine like the Greek, Roman, Siddha, Chinese and Unani.

This will also facilitate identification of not-yet-identified genes involved in the synthesis of important secondary metabolites in the plant. The next phase involves producing synthesized metabolites paving the way for mining biosynthetic pathways in other related species employing breeding

within the family of Lamiaceae, the plant belongs to.

Tulsi is known for its organic compounds like phenylpropanoids and terpenoids that make it a multipurpose medicinal plant used in diseases like bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases, arthritis, painful eye diseases, chronic fever, insect bite, etc. It has also been described to possess anti-fertility, anti-diabetic, anti-fungal, anti-microbial, hepatoprotective, cardioprotective, anti-emetic, anti-spasmodic, analgesic, adaptogenic and diaphoretic actions. Many of the basil oil constituents have found applications as medicinal ingredients, flavors, fragrance, etc.

With the genome sequencing, scientists hope that identifying specific genes for therapeutic molecules will make it easy to produce it in labs. The study was published on 28 May 2015 in *BMC Genomics*, 16:413 [DOI 10.1186/s12864-015-1640-z].



## Dr. Harsh Vardhan Flags off Mobile Laboratory Van of CSIR-NEERI



Dr. Harsh Vardhan, Union Minister for Science & Technology and Earth Sciences called air pollution in big Indian cities a major threat to the future generations. He made this observation while speaking at a function to mark the World Environment Day at the CSIR-National Environmental Engineering Research Institute (NEERI), Nagpur on 5 June 2015. The Minister later inaugurated a Green Museum and also flagged off a Mobile Emission Monitoring and Control Laboratory (MEMCL) developed by CSIR-NEERI.

While speaking as the chief guest at the World Environment Day function, Dr. Harsh Vardhan said, "The benefit of technological know-how in sorting out people's problems is ascertained only when the technology reaches everybody."

The mobile emission monitoring unit is capable of real-time sampling, analysis and control of air pollution from sources through flue gas treatability studies. It is equipped with a number of innovative technologies that would enhance CSIR-NEERI's air monitoring capabilities. The mobile emission monitoring van will monitor air pollution in metropolitan cities across the country over the next year. After year-long surveys and observations, CSIR-NEERI would be in a position to propose effective solutions for adoption on a war footing.

Remembering the great work of scientists like Dr. Jagdeesh Chandra Bose and Dr. C.V. Raman who worked under extremely adverse circumstances, the Minister called upon the scientists and technologists of CSIR-NEERI to take a pledge to make their reputed institution as well as the entire earth more beautiful. Dr. Harsh Vardhan also said that there was a need to build a positive and responsible consumer forum movement for development of healthy environment, keeping in view various types of growing pollution hazards.

CSIR-NEERI announced that it will open the doors of its 'Harit Sangrahalaya' or Green Museum to individuals, industries



and organisations to adopt best eco-friendly practices, and to promote sustainable development. The 'Harit Sangrahalaya' includes a "Kids Section" under which the virtues of biodiversity have been showcased with beautiful illustrations. Some working models have been prepared based on CSIR-NEERI technologies to highlight the electrolytic defluoridation process used to remove fluoride from water, phytoid technology for sewage treatment, "NEERI-ZAR" portable instant water filter, solid waste to biogas plant, decolourisation of effluent of textile industry, and common effluent treatment plant for industrial wastewater treatment.

A publication that compiles technologies transferred from the CSIR-NEERI to farmers and other stakeholders was released at the hands of Dr. Harsh Vardhan. He was also

apprised of other developments at NEERI, like the Bio-tech Park which would help in converting the city's garbage into bio-fuel and a project that would ensure that anything considered as wastage in nature is not wasted. The proposed biotechnology park project envisages the utilisation of municipal solid waste (MSW) and organic biomass as raw material for bio-fuels to address the waste management issues at reduced cost. The project would deploy biological and thermal processing options to propose the most economic and strategic option.

The World Environment Day function

was presided over by Dr. Madhukar Garg, director general of CSIR. He said, people should understand the value of environment and nothing on earth should be considered waste.

Earlier, welcoming all the dignitaries to the function, CSIR-NEERI director Dr. Satish Wate gave out a message: "You protect the nature, and the nature will protect you."

The other dignitaries present on the occasion included Guardian Minister of Nagpur and Maharashtra Energy Minister Chandrashekhar Bawankule, MLA Sudhakar Deshmukh, MLC Anil Sole and others.

### R&D Highlights

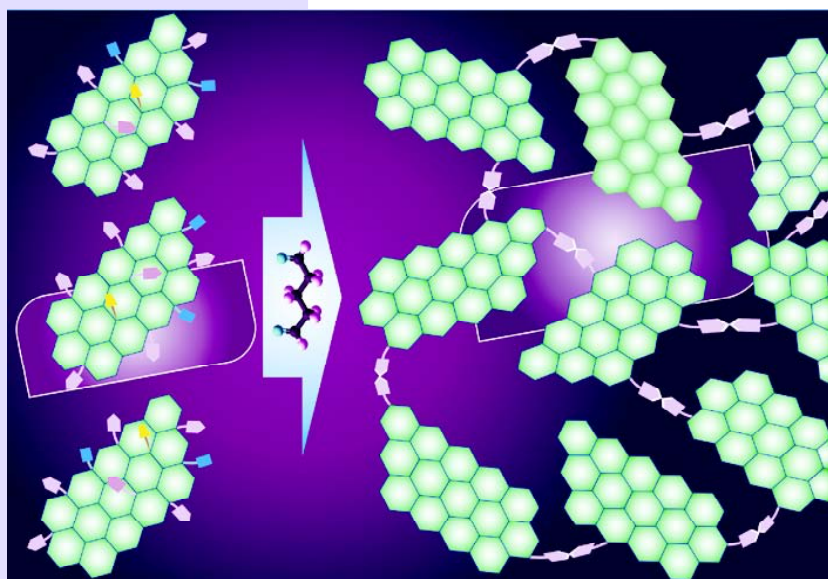
## Engineering Graphene for Better Electrodes and Sensors

CSIR-CECRI researchers Dr. Subbiah Alwarappan (Senior Scientist), Mr. Vineesh Thaze Veetil (CSIR-SRF) together with their collaborator Tharangattu Narayanan, Reader at DAE-TIFR have demonstrated the importance of engineering the electrode geometries in electrochemical applications such as sensing and energy technologies

The researchers state that the technical advancement in the field of ultra-small sensors and devices demands the

development of novel micro- or nano-based architectures. To address these necessities, these researchers have come up with the design and assembly of cross-linked three-dimensional graphene nanoribbons (3D GNRs) based electrode where individual 2D GNRs are bonded together through a covalent linker. The 3D electrode thus designed exhibits a huge double layer capacitance ( $2482 \mu\text{F}\cdot\text{cm}^{-2}$ ) and faster electron transfer kinetics. Further, its exceptional electrocatalytic activity towards oxygen reduction reaction is a prior indication of its potential for a wide range of electrochemical applications.

Moreover, the researchers proclaim that the study opens up a new platform for the design of novel point-of-care devices for clinical applications and electrodes for energy devices. Usually, the availability of plentiful electroactive surface area is a critical need for several electrochemical applications including sensing and energy technologies. In order to achieve this, researchers have attempted the use of high surface area nanomaterials. However, such modifications have not resulted in any significant improvement in the electron transfer rate or towards other observed electrochemical responses.



Schematic showing the 3D GNRs obtained by the covalent cross linking of individual 2D graphene sheets

To address these issues, the researchers engineered 3D GNRs electrode from 2D GNRs and these monoliths served as electrode for various reactions. The results evidenced that 3D GNRs outperformed their 2D counterparts in all the electrochemical applications that have been performed in this work.

**Reference:**

Thazhe Veetil Vineesh, Subbiah Alwarappan and Tharangattu N. Narayanan: The improved electrochemical performance of cross-linked 3D graphene nanoribbon monolith electrodes, *Nanoscale* (2015), 7, 6504.



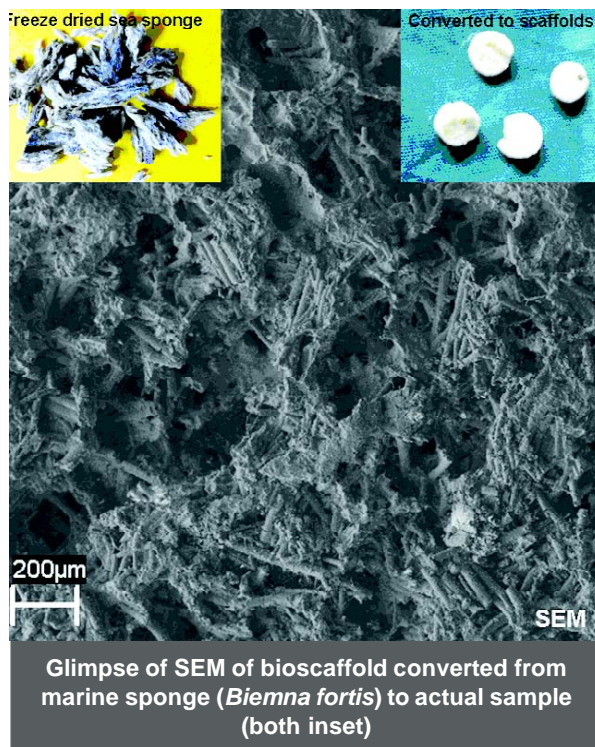
## Natural Marine Sponge Skeleton as a Bone Mimicking Biomaterial: A Trans-disciplinary R&D

CSIR-CGCRI has identified and characterized natural sponges from sea as potential bioscaffolds stand alone in combination with Insulin Like Growth Factor-1 (IGF-1) and Bone Morphogenetic Protein-2 (BMP-2) on the *in vivo* bone healing performance in rabbit model.

These natural marine sponges harvested from a beach in Goa were found to be promising materials for bone repair and augmentations both individually and in combination with growth factors. The IGF-1 impregnated converted sponge scaffold promoted excellent osseous tissue formation followed by the one with the BMP-2 loaded and the stand alone.

This multi-institutional research has been carried out in collaboration with CSIR-NIO, Goa, IIT-Guwahati and West Bengal University of Animal and Fishery Sciences, Kolkata. The results have been published in a Science Citation Indexed journal as follows:

S K Nandi, B Kundu, A Mahato, N L Thakur, S N Joardar, B B Mandal: *In vitro* and *in vivo* evaluation of the marine sponge skeleton as a bone mimicking biomaterial, *Integrative Biology* 7 (2) (2015) 250-262 (Impact Factor 3.99).



Glimpse of SEM of bioscaffold converted from marine sponge (*Biemna fortis*) to actual sample (both inset)

**MoUs**

### CSIR-CLRI joins with Stahl to make Leather Sector Sustainable

The CSIR-Central Leather Research Institute (CLRI), Chennai signed a 'Letter of Intent' (LoI) with chemical company Stahl India Private Limited to make the Indian leather industry more sustainable. Sustainable leather is one of the biggest challenges for the Indian leather industry.

CSIR-CLRI and Stahl India Private Limited will collaborate on resource conservation technology and joint R&D in bioprocessing apart from other activities that will be identified jointly from time to time. A few tanneries have been identified to be included in the project and this number will be expanded over time.



## CSIR-CFTRI signs MoU with CII for Agro, Food Processing Industry Growth in Mysore

The CSIR-Central Food technological Research Institute (CFTRI), Mysore has signed a memorandum of understanding with the Confederation of Indian Industry (CII) to create and sustain an environment to nurture all-round growth of agro and food processing industry in Mysore.

The MoU was signed at an awareness seminar-cum-workshop organised by CII and CSIR-CFTRI on value-added agriculture and food processing at Mysore. The MoU seeks to accelerate the pace of growth of agriculture and food processing in Mysore by looking at agricultural initiatives to deliver optimal policies and create a positive regulatory environment, encourage entrepreneurship and investment in the sector, provide a platform for domestic and overseas companies to explore the

collaboration and partnerships and forge stronger links between the industry and the institute.

Prof. Ram Rajashekar, Director, CFTRI, stated, “CII-CSIR-CFTRI would be a symbiotic interface among the industry, government and academia-research institutes in Mysore.”

Under the MoU, the two organisations would jointly engage in activities towards promotion of best agriculture practices and food processing including conducting awareness sessions, field visits, technical seminars and workshops. Further, it would also strive towards industry-institute joint research for the development of value-added agri produce and food processing by means of setting up an incubator facility with the support of various stakeholders.

### Events

## CSIR-IIIM and NASI hold Brainstorming Session on Climate Change

CSIR in collaboration with the CSIR-Indian Institute of Integrative Medicine (IIIM), Jammu and NASI, J&K Chapter organized a two-day brainstorming session on climate change. Union Minister of State in PMO, Dr. Jitendra Singh, was the chief guest on the occasion and the session was presided over by Prof. Akhilesh K. Tyagi, President NASI.

Dr. Jitendra Singh emphasized on having a holistic approach, more public awareness and increase stakeholding among the common people so as to involve all in the prevention of further environmental erosion and catastrophes as well as in the mitigation process. He said, “We should take a pledge that we will leave a relatively easy legacy for the coming generations.”

Earlier, Dr. Ram Vishwakarma, Director IIIM, Jammu and Chairperson of NASI, J&K Chapter welcomed the chief guest and other

participants and said that J&K is the most appropriate state to hold this brainstorming because of its unique agro-geo climatic zones.

Prof. Akhilesh K. Tyagi in his presidential remarks said that the National Academy of Sciences, India (NASI) is the first science academy of India established in 1930 by Prof. Meghnad Saha, the then Professor of Physics in the University of Allahabad, and a great patriot.

“Prof. Saha was not only famous for his outstanding scientific contributions to the world but also for his societal concern; he was called the ‘doctor of floods’ because of his river valley projects to mitigate the challenges,” said Prof. Tyagi, adding that the very idea of establishing the Academy was to link science with the society for the welfare of the general masses.

He further eulogized the role of NASI

in conducting such types of awareness and societal programmes. He also said that such programmes have great relevance in the current scenario as in the recent past India has witnessed an abnormal amount of disastrous untimely rainfalls in Uttarakhand in 2013, which resulted in the death of more than 10,000 people. More recently, Jammu and Kashmir also witnessed two floods, devastating several regions of the state within a year, leading to loss of life and livelihood as well as immense economic burden. He added that the consequences include

unpredictable, harsh and unplanned alterations in environment and climate across India.

According to the recent report of the United Nations Intergovernmental Panel on climate change, the Himalayan region will witness an increase of 5-10 rainy days by the 2030s and the intensity of the rainfall is also expected to rise. "We have also witnessed a series of earthquakes in the Himalayan range in the recent past with devastating effects in Nepal as well as some parts of our country," he said.



## World Environment Day 2015 observed at CSIR-NEIST

CSIR-NEIST, Jorhat and Assam Science Society-Jorhat branch joined hands to celebrate this year's World Environment Day with a special function held in the Dr. J.N. Baruah Auditorium, CSIR-NEIST on 5 June 2015.

Convened under the global theme, "Seven Billion Dreams, One Planet, Consume with Care", the function was graced by Prof. B.K. Sarmah, Director, DBT-Centre, Assam Agricultural University, Jorhat as Chief Guest while Dr. D. Dutta, Scientist, Rainforest Research Institute-Jorhat was present as the Guest of Honour. The function was presided over by Dr. R.C. Boruah, President, Assam Science Society-Jorhat branch and Outstanding Scientist, CSIR-NEIST.

Delivering his welcome address on the occasion, Dr. D. Ramaiah, Director, CSIR-NEIST emphasized the need to raise awareness about the importance of a healthy, safe and green environment. He pointed out that it is not the responsibility of only environment experts or certain regulatory bodies to protect and conserve the environment but it is something which every individual should be concerned about and contribute at their own level.

Prof. Sarmah in his lecture *Green Biotechnology for Green Environment*, deliberated on the role of Biotechnology in food security while keeping the environment green. He



particularly stressed on the genetically modified crops which have gained critical attention in the past few decades. As per ISAAA report, he said that during 1996-2014, a number of GM crops with insect-resistant ability were adopted.

The world has also been able to protect the quality of soil due to development of microbe-based formulations as fertilizers instead of chemicals, he said. As a proponent of GM crops he said that this method started

long back and can be seen from the hybridization works of Gregor Mendel during the 1860s. Prof. Sarmah further spoke about his work carried out in AAU for developing transgenic Chickpea which is resistant to stored grain pest. He said that in India until last year, Bt Cotton was the only approved GM crop hugely successful in the country, but now other crops such as Rice, Brinjal, Mustard and chickpea have also been

approved by the new government for field cultivation. And this initiative will go a long way in meeting the food demand of the ever growing population without compromising the health of the environment, he said.

Dr. D. Dutta in his address spoke about the importance of sustainable exploration and consumption of natural resources. He said that as per UN estimate, the world population would be 10 billion by 2050 which will be a great threat to the planet earth. It is high time that we focus on exploration and not exploitation of natural resources, check its depletion, check food security, check environment safety issues and so on, he opined. Sharing his message, he urged all to think of sustainability and the future of mankind.

Dr. R.C. Boruah in his presidential remarks also advocated optimum use of resources and to surge ahead without compromising the sustenance of the future generations. He shared a famous quote by Mahatma Gandhi which says that, 'What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another'.

The function concluded with vote of thanks proposed by Dr. Jatin Kalita, Scientist, CSIR-NEIST.



Prof. B.K. Sarmah delivering his lecture on, "Green Biotechnology for Green Environment"

## National Technology Day Celebrated at CSIR-NBRI, Lucknow

The National Technology Day was celebrated by CSIR-National Botanical Research Institute, Lucknow on 11 May 2015. The day was observed as 'Open Day' when its various laboratories, Exposition, Herbarium, Library, and Botanic Garden were visited by a large number of students drawn from various local schools and colleges.

Padma Shri and Padma Bhushan (Prof.) G. Padmanaban, INSA Senior Scientist/Hon. Professor, Indian Institute of Science, Bangalore & Senior Science and Innovation Advisor, BIRAC, DBT, New Delhi, was the Chief Guest of the function. Prof. Padmanaban delivered the National

Technology Day lecture on "*Relevance of Biotechnology to Indian Agriculture*".

Dr. P.V. Sane, Former Director of CSIR-National Botanical Research Institute was the Guest of Honour. Distinguished guests, scientists and staff of CSIR-NBRI, researchers and students were present on this occasion.

In his welcome address, Dr C.S. Nautiyal, Director, CSIR-NBRI and CSIR-IIITR, Lucknow, highlighted the importance of celebrating the National Technology Day and reminded about the drive, dedication and commitment the Indian scientists have shown in making path-breaking technological

innovations in several fields.

Prof. Padmanaban in his talk said that India accounts for 18% of the world's population and 15% of the global livestock. But it occupies only 2.3% of the global land area. Productivity of almost any crop is low in India, ranging from 30 to 50% in comparison to other countries. He suggested that innovations in dryland agriculture have tremendous potential to increase productivity.

Highlighting the many facets of agri-biotechnology, Prof. Padmanaban pointed out that this large canvas has been unfortunately reduced by opponents of agri-biotech to just Bt (*Bacillus thuringiensis* toxin)-crops and just to Bt-cotton in India. With the advent of Bt cotton cultivation, India became a cotton-exporting country from that of a cotton-importing nation, he added.

Prof. Padmanaban emphasized that, unfortunately, the most successful technology innovation in India, namely Bt cotton, has come in for criticism by activists, most often not based on scientific facts. Nearly 20 years of research went into using Bt gene as a biocide to combat major pests. Bt crops have gone through extensive trials, both for environmental safety and health parameters in experimental animals. The scientific proof for the safety of Bt is that it needs to be realized that millions of people (US, Canada, China, Brazil, Argentina, etc.) and livestock have been consuming Bt corn for over 15 years. Europe has been importing GM foods all along. It is difficult to believe that developed countries would let their population and livestock to be fed on unsafe food. India has formulated very strict guidelines for the conduct of GM trials. Unfortunately, there is an embargo on the commercialization of Bt brinjal, but Bangladesh has commercialized the technology from India!

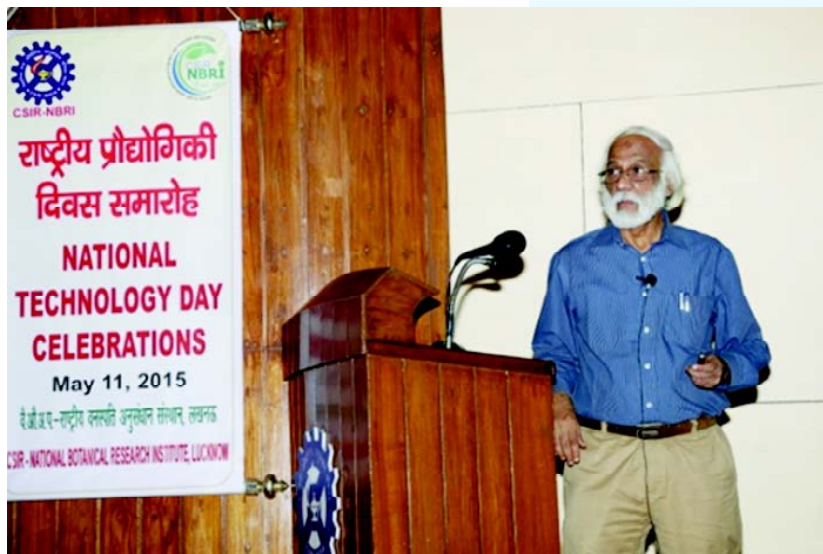
Prof. Padmanaban said, "It is time for us to ponder over the fact that India has entered a phase where technologies are being developed and in the name of fighting MNC domination, we are only hurting indigenous technology development. We need to use the most appropriate technology for a given crop and trait to provide India with food and

nutrition security."

Dr. P.V. Sane complimented CSIR-NBRI for its outstanding contributions in agri-biotech research. In order to develop commercially viable agri-biotechnologies, especially in crops like cotton, Dr. Sane urged scientists to forge collaborations among concerned institutions and industries in India, so that enhanced capabilities can be built up for efficient tissue culture, transformation and testing the GM and non-GM plants under natural conditions. He also suggested that horticultural plants should be accorded high priority in agri-biotechnology research in India.



**Prof. G. Padmanaban, INSA Senior Scientist, Indian Institute of Science, Bangalore, lighting the lamp along with Dr. C.S. Nautiyal, Director, CSIR-NBRI**



**Prof. G. Padmanaban delivering the National Technology Day lecture**

## World Intellectual Property Day and World Copyright Day Celebrations at CSIR-NAL

CSIR-National Aerospace Laboratories, Bengaluru celebrated the World Intellectual Property Day and World Copyright Day on 23 April 2015 at the S.R. Valluri Auditorium. The half-day event comprised a key note lecture and panel discussion on “*Intellectual Property Rights for Scholarly Communication: Copyright, Plagiarism, and Fair Use*” organized by ICAST. The objective of the programme was to create awareness about Copyright Infringement and Plagiarism concepts among authors/scientists and library professionals.

The programme started with a welcome address by Dr. (Mrs) Poornima Narayana,

Head ICAST. Dr. L Venkatakrishnan, chairman, LAC and Head, EAD, set the theme for the day by talking about the history and various types of Intellectual Property Rights and the importance of celebrating IP day on 26<sup>th</sup> of April every year. He informed the audience about the initiatives CSIR-NAL has taken to capture intellectual output through PRAKAS and also the integration of iThenticate, plagiarism checking database, along with it.

Mr. Ananda Byrappa, Global Leader, Whiteny Knowledge Center, GE, Bangalore delivered the keynote lecture on *Driving*

*Copyright Compliance in Organizations: Policies, Practices & Tools.*

The speaker started his lecture with a brief introduction of copyright and importance of copyright compliance in organizations. He highlighted various issues related to copyright compliance in organizations, and informed the audience about steps taken at his organization General Electric in this direction.

The keynote lecture was followed by an interactive panel discussion on “*Intellectual Property Rights for Scholarly Communication: Copyright, Plagiarism, and Fair Use*”. The panel consisted of Authors, Editors, IPR experts, Publishers and Librarians. While Dr. L Venkatakrishnan moderated the discussion, the panelists were Prof. Periasamy, Chief Editor,



Key Note Lecture by Ananda Byrappa, Global Leader, Knowledge Centre, GE

Presidential remarks by Director NAL

Welcome address by Poornima Narayana, Head, ICAST

Setting the theme of the day by Dr. L Venkatakrishnan, Chairman LAC and Head EAD

*Journal of Chemical Sciences*; Dr. S. Rama Murthy, IPR Expert & Faculty, Jain University; Mr. Aananda Byrappa, Global Leader, Whiteny Knowledge Center, GE and Dr. Aruna ST, Principal Scientist, CSIR-NAL.

The panelists addressed various issues related to copyright, plagiarized content, fair use of published content, journal article

acceptance procedures, organization policies regarding copyright, inter-library loan materials, etc. The panel discussion witnessed sound interactions with panelists receiving a large number of queries. Mr. Satya Ranjan Dey proposed the vote of thanks.

**Shivaram BS at CSIR-NAL**



## CSIR-IICB Organizes Research Festival

CSIR-IICB organized the 3<sup>rd</sup> Annual Research Festival of its faculty scientists in a one-day meet on 5<sup>th</sup> June 2015 at the Salt Lake Campus of the Institute.

Eleven faculties presented their work in three different scientific sessions dedicated to “Structure, Function and Biology of Macromolecules”, “Chemistry of Biomolecules” and “Biology of Diseases”. A separate session for interactive discussion on “Upcoming Problems in Biology: Positioning of CSIR-IICB” was also held.

The interactive session was chaired by Dr. Syamal Roy, eminent immunologist of CSIR-IICB. The interactions listed three major research questions that were identified to be associated with key fields where CSIR-IICB could make a dent in the world scenario. In one such proposed project, pathophysiological aspects of neglected tropical diseases were taken as challenges that CSIR-IICB could take up.

The event served its purpose to hold interactive discussions between scientists from different research backgrounds and of different expertise. The interaction facilitated the development of further discussion on possible collaborations between biologists and chemists to address interdisciplinary research problems.

This year, as per the recommendation of Dr. Chitra Mandal, the Acting Director of CSIR-IICB, a separate event was held on 9<sup>th</sup> April to celebrate the CSIR-IICB Students Research Festival. This event was held as part of the 59<sup>th</sup> Foundation day of CSIR-IICB. The half-day event was organized to accommodate twenty one talks delivered by CSIR-IICB PhD. The interactive question-answers sessions were of special interest and the quality of the research was truly reflected by spirited and high-standard presentations by the students.



Glimpses of the Research Festival at CSIR-IICB

Visits**Union Minister for Science & Technology and Earth Sciences visits CSIR-AMPRI**

The Minister addressing the gathering

“Smart and Advanced Materials can play an important role in transforming India,” said Dr. Harsh Vardhan exhorting scientists to develop more materials to cater to the changing needs.

Dr. Harsh Vardhan, Union Minister for Science & Technology and Earth Sciences, during his visit to CSIR-AMPRI on 10 May 2015 asked scientists and technologists to work on developing smart and advanced materials that would be suitable to fulfill the country’s requirements.

Addressing the staff of CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal, Dr. Harsh Vardhan said that we are talking about innovate in India. The R&D work on Aluminium Foam, Aluminium Metal Matrix Composites, Electro Magnetic Forming, Actuators and Sensors being carried out here are innovations that can change the scenario. He said that the technology relating to SiC reinforced composites (AIMMC) being transferred to M/s Exclusive Magnesium, Hyderabad is a big move in this direction. He urged the scientists to develop more such technologies.

Dr. Harsh Vardhan also lauded the work on use of fly ash done at CSIR-AMPRI as it could provide support to the strategic sector while at the same time solving the environmental problem.

Dr. Harsh Vardhan also visited several laboratories of the Institute and addressed the staff. He said that the only CSIR Institute located in the heart of the country can take lead in addressing the challenges faced by the people of the area like drinking water, utilization of waste materials, sanitation, etc. and that the work currently going on here directly addresses the agenda of transforming India. He also appreciated the R&D work being done by the Institute in the newer areas



Dr. Harsh Vardhan going round the Institute



Hon'ble Minister releasing the half-yearly newsletter *Agrasar*

like Graphene and Carbon Nano Tube-based composites.

An exhibition of products and processes developed by CSIR-AMPRI was put on display on the occasion. Dr. Harsh Vardhan visited the exhibition and appreciated the work done by the scientists. He also released the half yearly newsletter of the institute, *Agrasar*.



## Exhibitions

# CSIR at Synergy 2015 – Empowering Bengal’s Enterprise

Globally, MSMEs or the Micro, Small and Medium Enterprises are the engines of economic growth that promote equitable growth and enhance inclusiveness. These are also the backbone of the Indian economy. No wonder, West Bengal is focussing on the enhancement of this sector. According to the West Bengal MSME Policy 2013-18, the vision is to create a sustainable ecosystem in the MSME sector which can maximize the utilization of resource and widen the area of operation to make the state emerge as the MSME leader in the country in the next ten years.

In this context, in September 2013, a Memorandum of Understanding had been signed between CSIR and the Government of West Bengal regarding the establishment of the MSME-Technology Facilitation Centre (TFC). CSIR-Central Glass and Ceramic Research Institute, Kolkata, is the Nodal Centre for this project and houses the TFC, which CSIR set up together with the Government of West Bengal.

The Department of Micro and Small Scale Enterprises and Textiles, Government of West Bengal organizes an event named



*Synergy* to focus on multi-dimensional and customized solutions to the MSME business needs. This also includes guidance on regulatory compliances and financial aid.

During 29 May 2015 to 31 May 2015, *Synergy 2015* North 24 Parganas, Nadia was organized at the Guru Nanak Institute of Dental Science and Research, Panihati, to attract potential entrepreneurs and to extend support to existing MSMEs, particularly those in the districts of North 24 Parganas and Nadia. It is interesting because this area has the potential to be selected for the creation of Electronic cluster and Photonics cluster. The town of Naihati also has the potential

for the setting up of a Technology Park for electronics and ICT-enabled technologies. Thus this particular *Synergy* event could well be seen as an exploratory event to gauge the capacity building required to tap an untapped potential.

This was the fifth *Synergy* event in the series and was well-attended by high-ranking government officials, entrepreneurs and interested members of the public. The event was extensively covered by the print and electronic media.

The theme of the MSME-TFC Pavilion during *Synergy-2015*, North 24 Parganas, Nadia was: *Devices, Instruments and Machinery*. Efforts were made to ensure that technologies suitable for these two districts were displayed so as to address local needs. CSIR-CGCRI has a long history of accomplishments in application-oriented research with particular emphasis on optical telecommunications and photonic components. Currently, the Institute has indigenous technology to produce specialty fibres for many important applications. These have appreciable market potential. Thus devices/technologies from the Fibre Optics Laboratory at CSIR-CGCRI were chosen for display at the pavilion.

In consonance with the theme, Erbium-doped Fibre Amplifier for CATV Application; Specially Designed Optical Fibre and Jacketed Optical Fibre were displayed. Erbium-doped fibre amplifier working in the C-band is an essential instrument for long-distance trouble-free and uninterrupted communication. Specialty Optical fibres from CSIR-CGCRI include: Rare earth doped fibres for optical amplifiers, large core rare-earth doped fibres for fibre lasers, photosensitive fibres for writing Bragg gratings, highly non-linear PCF for supercontinuum sources, radiation soft fibres for dosimeter applications, radiation resistant fibres for nuclear environments and fibres for sensor applications.

Specially designed posters on cutting-edge technologies were put up and attracted a lot of attention from prospective entrepreneurs. During the Inaugural Session, attention was paid to discussions on different areas of importance to the MSMEs such as: Statutory Norms and Compliance in MSME

Sector; Pollution Norms and issues affecting the growth of MSMEs; Tax-related issues; Financial Literacy; Norms and provisions related to Power usage; Business Plan Preparation, etc.

On the second day, there were sessions on Packaging, Fire Safety (with demonstration), and Corporate to name a few areas. In addition, there was provision for online facility for filing of Entrepreneur's Memoranda. Clinics-cum-Help Desks were set up to provide immediate access to information and guidance to those seeking it.

Other Clinics-cum-Help Desks at the event included: MSME Pavilion: Handloom, Khadi, Food processing etc., North 24 Parganas District Help Desk and Nadia District Help Desk, Statutory compliance single window: MSME Facilitation Centre (MFC), Single Application Gateway (SAG) and [www.myenterprisewb.in](http://www.myenterprisewb.in).

Visitors to the Finance Pavilion-Clinics had access to different banks such as SBI, UBI, PNB, Allahabad Bank, CBI, IB, BOB, UBOI, UCO IOB, Uttar Banga Kshetriya Gramin Bank, West Bengal Financial Corporation, Bandhan, etc.

The Statutory Compliance Pavilion included Clinics hosted by different Government Departments. The Infrastructure Pavilion included Clinics by West Bengal State Electricity Distribution Company Limited, Calcutta Electric Supply Corporation, West Bengal Industries Development Corporation, West Bengal Small Industries Development Corporation, etc.

The Marketing Pavilion included Clinics by National Small Industries Corporation, MSME-Development Institute, Indian Institute of Petroleum, Federation of Indian Export Organisations, and Bureau of Indian Standards. Similarly, the Commercial Tax Pavilion was hosted by Directorate of Commercial Taxes; the Skilled-HR Pavilion by Department of Technical Education & Training and the Project Consultancy Pavilion by Institute of Company Secretaries of India, WEBCON, Small Industries Development Bank of India, etc.



# CSIR-NBRI's Dehydrated Floral Crafts Technology in Meghalaya



CSIR-NBRI, Lucknow is the pioneer institution for development of dehydration technique of flowers and foliages, and making various products from these. The institute has been promoting the introduction of dehydrated floral crafts for augmentation of income by various groups of society. Adopting this technology of value addition, the beneficiaries can earn money and it is a good source of employment generation in the rural sector for farmers, rural women and unemployed youth.

In the dehydrated floral crafts technology, the colour of the dried flowers and foliage remains in original state after pressing/drying. This technique is very ideal for making high quality herbarium specimen and for making different types of value-added beautiful high quality products viz. greeting cards, wall hangings, book marks, landscapes, scenery, table mats, coasters and greeting card envelopes. The value-added floriculture is a simple field-based technology that has easy adoptability by the rural people without much scientific and technological requirement.

CSIR-NBRI, Lucknow and Meghalaya Basin Development Authority (MBDA), Meghalaya are working in collaboration through Bio-resources Development Centre (BRDC) to ensure inclusive and sustainable growth of the NE Region in general and Meghalaya in particular. Dehydrated floral craft (DFC) of CSIR-NBRI has identified for promoting as income generating activity and women empowerment tool. The workshop on introduction of DFC for augmentation of income of women of Meghalaya was organized on 19-20 July 2013 at Shillong.

Since its first training in July 2013 with 30 participants, the BRDC has till date empowered 114 women in 36 clusters across the State with knowledge on DFC. The technology is branching out, as the trained women are willingly acting as Master Trainers, and extending this technology



Solar dryers for drying plant materials



Exhibition of dehydrated floral crafts

within their groups/clusters across the State.

The products made till date include Greeting cards, Frames, Carry bags, Slip Boxes, Notepads, Pen stands, etc, about 15,000 in number. This technology has greatly benefited the women as it has provided them with additional income in their livelihood. The market linkages have been established through Asian Confluence,

Shillong; Green Technologies, Kanpur and Tamrapatra, Dehradun.

The major challenge in this endeavor is the requirement of electrical energy for drying the plant materials. The green energy solution, utilising solar dryers for the purpose, is considered as the most appropriate and right-time intervention for the women entrepreneurs.

On 24 April 2015, a programme was organized under the Integrated Basin Development & Livelihood Promotion Programme at Shillong for providing green energy solution to rural women entrepreneurs engaged in enterprise, adopting green technology. It was a collaborative initiative of MBDA, C&RD department, CSIR-NBRI and BRDC. On this occasion, women entrepreneurs of 36 DFC

clusters were present along with officials of the Meghalaya government, BRDC and CSIR-NBRI.

An exhibition of DFC products, made by these groups was arranged on this occasion. Solar dryers were gifted to all the 36 DFC clusters. The technology was appreciated as a good source of employment generation in the rural sector for women and unemployed youth. It was realized that wild/unutilized/underutilized plant species and ornamental cut flowers could be value-added as marketable products by adopting this green technology. Dehydrated Floral Craft could be a possibility as sustainable livelihood option for rural women by providing and upscaling their skills which are rewarding.

**S.K. Tewari at CSIR-NBRI**



DFC cluster members with officials of MBDA and CSIR-NBRI

### Honours & Awards

## CSIR-NGRI Scientist elected to the Council of the Telangana Academy of Sciences

Dr. G. Parthasarathy, Chief Scientist, CSIR-National Geophysical Research Institute, Hyderabad has been elected as an Executive Council member of the Telangana Akademi of Sciences for the period 2015-18.

Dr. Parthasarathy has been working for CSIR-NGRI since the past two and half decades and his work got him recognitions such as Fellow of the Indian National Science Academy, National Mineral Award, and Fellowship of the Royal Society of Chemistry, UK. He has published about 200 peer-reviewed research papers, and has eight patents to his credit.



## CSIR-IICB Scientist Receives Gold Medal at ‘Innovators Competition’



Dr. Nahid Ali, Chief Scientist, Infectious Diseases and Immunology Division, CSIR-IICB, was awarded the Gold Medal and a certificate at the “Innovators Competition” for DST-Lockheed Martin India Innovation Growth Programme 2015. The award was given by Dr. Harsh Vardhan, Hon’ble Minister of Science & Technology & Earth Sciences, Govt. of India on 13 May 2015 in a ceremony held in DRDO Bhavan, New Delhi.

Dr. Ali’s innovation, a dipstick device for the diagnosis of Kala-azar and PKDL, has been selected among top 10 technologies out of 1500 applications received this year. The technology has already been filed for patent and also published in the *Journal of Emerging Infectious Diseases* (Saha *et al*, 2011; 17: 1304-06).

The India Innovation Growth Programme is a joint initiative of the Department of Science and Technology (DST), Govt. of India; Lockheed Martin Corporation; Indo-US Science and Technology Forum (IUSSTF), Federation of Indian Chambers of Commerce and Industry

(FICCI); Stanford Graduate School of Business and the IC2 Institute at the University of Texas. The aim of this programme is to accelerate innovative Indian technologies into the global markets.



Dr. Ali receiving the award from Union S&T minister

The business development managers at FICCI and IC2 Institute will support in commercializing Dr. Nahid Ali’s technological innovation and find suitable business partners in India as well as in global markets.

## CSIR-NBRI Scientist Conferred ‘E.K. Janaki Ammal National Award for Plant Taxonomy 2015’

Dr. D.K. Upreti, Chief Scientist of CSIR-National Botanical Research Institute, Lucknow, has been conferred the prestigious ‘E.K. Janaki Ammal National Award for Plant Taxonomy 2015’ by the Ministry of Environment, Forest and Climate Change, New Delhi, for his contributions in the field of Lichen taxonomy. Instituted in the name of Late Prof. Dr. E.K. Janaki Ammal, an eminent scientist and botanist of international repute, this award is given to encourage work of excellence in plant, animal and microbial taxonomy.



Dr. D.K. Upreti being conferred with the ‘E.K. Janaki Ammal National Award for Plant Taxonomy 2015’

Dr. D.K. Upreti's consistent and remarkable work during the last three decades has led to the discovery of more than 100 new species and more than 200 species as new records to the lichen flora of India. He pioneered lichenometric studies in the Indian Himalayan region to record the glacial retreat caused as the result of global warming. The biomonitoring and bioprospection studies conducted by him on Indian lichens and his

work on the Antarctica lichens and their response to environmental pollutants are widely recognized.

The award was given by Shri Prakash Javadekar, Minister of Environment, Forest and Climate Change, Government of India, on 5<sup>th</sup> June 2015 – the World Environment Day. The award carries a cash prize of Rupees One Lakh, medallion and a citation.

## CSIR-NISCAIR Scientist Made Fellow of the Association for Plant Taxonomy

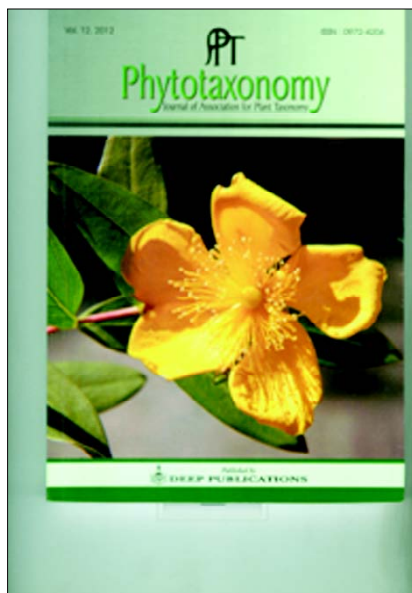
Dr. Pradeep Kumar Sharma, Senior Principal Scientist, CSIR-National Institute of Science Communication and Information Resources (NISCAIR), New Delhi was recently made the Fellow of the Association for Plant Taxonomy, Botanical Survey of India, Dehradun for his “contribution to the field of revision, floristics, or monographic work in Plant Taxonomy”. Dr. Pradeep Kumar Sharma is Editor of the Hindi monthly popular science magazine *Vigyan Pragati* and the half-yearly Hindi research journal *Bharatiya Vaigyanik Evam Audyogik Anusandhan Patrika*.



Dr. Sharma has also been Editor of the CSIR newsletter *CSIR Samachar* and the encyclopaedic series *Bharat ki Sampada—Prakritik Padarth*. He played significant role in bringing out Vols VII, VIII, IX & X of this series publication. He also served as the Editor of *Sanchetna*, the Rajbhasha Patrika published by CSIR-NISCAIR. Besides, he has also

been the Editor of *Phytotaxonomy*, the journal of the Association for Plant Taxonomy. Dr. Sharma obtained DPhil degree in Botany from HNB Garhwal Central University, Uttarakhand for his exhaustive work on “The analysis of the dominance and utility pattern of the tree species dealt in *The Wealth of India—Raw Materials Series*” brought out by CSIR-NISCAIR, New Delhi.

Dr. Sharma has won several prestigious awards such as Atma Ram Puraskar (2006); Hindi Academy Award for quality editing of *Bharatiya Vaigyanik Evam Audyogik Anusandhan Patrika*; Deepak Rathore Memorial Award for Science Communication-2005 by Vaigyanik Drishtikon, Jaipur, Rajasthan; Bharatiya Vigyan Krantidoot Samman Puraskar-2004 by Vivekanand Shaikshank, Sanskritik evam Krida Sansthan, Deoghar, Jharkhand; Sahitya Gaurav Award 2007 and Nobel India Award 2008 by Yuvak Samooch Prakashan, Wardha, Maharashtra; Sampadak Sartaj 2007 and



Kalam Kaladhar 2008 by Akhil Bhartiya Sahitya Sangam, Udaipur, Rajasthan; Aryabhat Puraskar 2009 by Vigyan Bharti, Swadeshi Science Movement, Delhi and Best Editor

Award 2009 for understanding and recognition in the field of journalism by Society for Recent Developments in Agriculture, Meerut (UP).



## Special issue of *Molecular Physics* in honour of Dr. Sourav Pal's 60<sup>th</sup> Birthday

*Molecular Physics*, a peer-reviewed international journal published by Taylor & Francis Group, is bringing out a special issue as a Sourav Pal Festschrift to recognize and honour Dr. Sourav Pal's contribution to physical chemistry.

The journal publishes quality research papers that cover all experimental and theoretical aspects of Molecular Science from electronic structure, molecular dynamics, spectroscopy and reaction kinetics to condensed matter, surface science, and statistical mechanics of simple and complex fluids. The special issue carries articles from eminent quantum chemists and electronic structural theorists from all over the world.

The special recognition by one of the best journals is a great honour for CSIR-National Chemical Laboratory. Dr. Sourav Pal has been serving as its Director from December 2010.

Dr. Pal joined the CSIR-NCL in 1982 after completing his integrated master's degree in Chemistry from the Indian Institute of Technology (IIT) Kanpur in 1977. He received his Ph.D. degree from Calcutta University. He is a distinguished chemist and has been working at CSIR-NCL for the past more than 30 years. Dr. Pal has been associated with several important management positions at CSIR-NCL and played an important role in shaping the vision of the laboratory as the Director.

Dr. Pal has contributed to diverse areas of theoretical chemistry, many-body theory of molecular electronic structure, chemical reactivity and density functional theory and catalytic and hydrogen storage materials employing computational material science.

Dr. Pal has been recognized by several awards and honors for his contribution to



science and technology including the prestigious Shanti Swarup Bhatnagar Award in Chemical Sciences, First Sastra-CNR Rao award in Chemistry and Material Science.

He is the Fellow of all three National Science Academies of India. He is also a Fellow of the Royal Society of Chemistry, J.C. Bose National Fellow of the Department of Science and Technology.

Dr. Pal serves on the editorial boards of several international and national journals in chemistry and has guided over 25 Ph.D. theses. He has published over 225 papers in international peer-reviewed journals. He has been elected as the President of the Chemical Research Society of India for a tenure of three years from April 1, 2014.

Recently, Dr. Pal was invited to be a Distinguished Visiting Professor at the Indian Institute of Technology (IIT), Kharagpur and a Visiting Professor at Nicolaus Copernicus University in Toruń, Poland.

## NRDC Meritorious Innovation Award for CSIR-CGCRI

The “Technology on Manufacturing Specialty Borosilicate Glass Bead for Nuclear Waste Immobilization” by CSIR-CGCRI, Kolkata has been selected for the *NRDC Meritorious Innovation Award for the year 2013*.

The awardees are Dr. Ranjan Sen, Chief Scientist, Mr. Sitendu Mandal, Senior Principal Scientist, Mr. Alok Roy Chowdhury, Technical Officer, Dr. (Mrs.) Dipali Kundu, Senior Principal Scientist and Mr. Prasanta Chaudhuri, Former Scientist (Retd.) from CSIR-CGCRI. The award contains a Trophy, Citation and cash award of Rs. 5 Lakhs (Rupees Five Lakhs only) for the team members. The awards were distributed on 25<sup>th</sup> February 2015 during the *Innovate India 2015* programme at PSG College of Technology, Coimbatore.

The borosilicate glass bead in  $\text{SiO}_2\text{-B}_2\text{O}_3\text{-Na}_2\text{O}$  system is a critical material required for management of radioactive waste in a closed nuclear fuel cycle that is followed by India and has been indigenously developed by CSIR-CGCRI in the form of spherical-shaped bead of desired sizes having stringent

physical, chemical and mechanical properties. It functions as feed base glass to produce vitrified product during immobilization of radioactive waste. In this process, glass beads with specific composition are fed into high-temperature Joule Melter along with High Level Radioactive Liquid Waste (HLW) in a predetermined ratio to make the product glass with the desired properties. This ensures confinement of the radio isotopes in a stable matrix and safe disposal with no threat to the environment. The innovation provides waste volume minimization, recovery and recycles of valuables during nuclear waste immobilization and is of significant importance for the country’s nuclear power programme. The material is now being commercially produced by M/s H.R. Johnson, Mumbai using this technology to meet the requirement of the Department of Atomic Energy. The development of the technology is a significant step forward towards the country’s self reliance in this important strategic sector.



*Borosilicate Glass Beads*



Clockwise: Team CSIR-CGCRI comprising of Dr. Ranjan Sen, Sitendu Mandal, Prsanta Choudhury, Dr. Dipali Kundu and Alope Roy Chowdhury receiving awards from Dr V.K. Saraswat, Member, NITI (National Institute for Transforming India) Ayog



*CSIR News is profiling all the CSIR laboratories throwing light on the significant areas they work in and their achievements.*

## Central Electrochemical Research Institute (CECRI), Karaikudi

Reputed for its anti-corrosion and clean electroplating technologies and equally well known for its lightweight batteries and work on fuel cells, CECRI is today the mainstay of the electrochemical industry in the country.

CSIR-CECRI is the largest research establishment for electrochemistry in South Asia. It serves as a launching pad for a multitude of technologies for the Indian electrochemical industry. The 750 patents, 250 processes, 600 sponsored and grant-in-aid projects, 450 licensee and 5,500 research and review papers that the institute boasts of are ample testimony to its leadership in nation building.

Headquartered at Karaikudi, CSIR-CECRI has extension centres in Chennai, Mandapam and Tuticorin focusing on fuel cells, marine corrosion and offshore corrosion testing.

In living up to its *raison d'être*, the institute works on a gamut of problems covering all facets of Electrochemical Science and Technology: Corrosion Science and Engineering, Electrochemical Materials Science, Electrochemical Power Sources, Electrochemical Pollution Control, Fundamental Electro Chemistry, Electro metallurgy, Industrial Metal Finishing, and Nanoscale Electrochemistry.

CSIR-CECRI's activities are directed towards the development of new and improved products and processes as well as novel innovations in electrochemical technology. A number of investigations are run in collaboration with laboratories from within and outside India. Agencies that tap CSIR-CECRI's expertise include small and big private industrial houses as well as government agencies such as atomic energy, defence, environment, space, surface

transport, and ocean development. Apart from engaging in basic and applied research, CSIR-CECRI assists the industry by conducting surveys and undertaking consultancy projects. The institute also conducts short-term refresher courses for the benefit of industrial houses and educational institutions.

Developing cost-effective technologies to meet global needs has been the hallmark of CECRI. Over the years it has helped solve problems relating to corrosion science and engineering, batteries and fuel cells, electrochemicals, electrochemical materials science, functional materials, industrial metal finishing, electrometallurgy, electrodisks and electrocatalysis, nanoscale electrochemistry, electrochemical instrumentation and pollution control.

### Strategic areas

As a true participant in nation building, CECRI takes up technology development programmes in strategic areas such as defence, space, and atomic energy. These include technology for electrowinning of calcium metal, corrosion protection of missile



Photovoltaic Battery Testing Station

components, preparation of nitrogen pentoxide, and development of conducting polymer for EMI shielding of radar transmitter cabinets.

CECRI scientists have also made major contributions in electroforming technology as applied to cryogenic rocket engine thrust chambers. The development of such a cost-effective, indigenous technology is a boon for India's rapidly expanding space programme leading to savings of millions of rupees in foreign exchange. The development of titanium substrate insoluble anode is another benchmark achievement by CECRI.

### Corrosion protection

CECRI's technological breakthroughs in the area of corrosion protection, especially relating to steel structures, are well known. A technology for cement polymer composite coating system developed by CECRI has found wide application in bridges, flyovers and multi-storey buildings, and is superior

to similar technologies available in India and elsewhere.

Other areas of note include coatings, paints, inhibitors and surface treatments for a variety of corrosion protection strategies; paint systems for fluorescent and reflective sign boards; corrosion protection of Portland pozzolana cement structures; corrosion monitoring by harmonic analysis; corrosion-resistant composites for aerospace and military applications; and *in situ* localized corrosion analysis.

### Electrodics and electrocatalysis

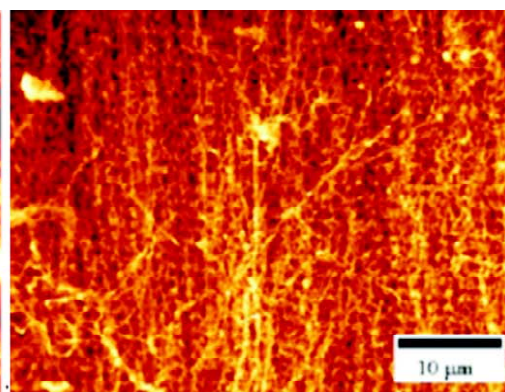
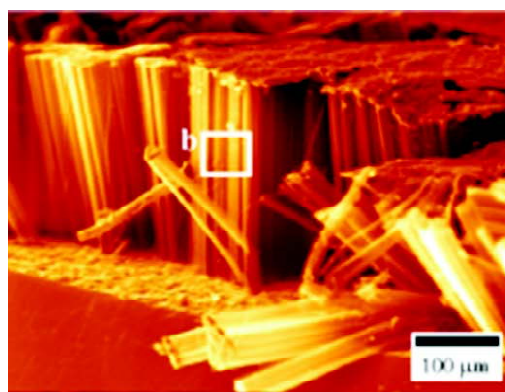
Expertise available under this category relates to ion-selective electrodes, low self-noise Ag/AgCl electrodes, cost-effective diagnostic kits, sensors for methanol, calcium ions, dopamine and uric acid, portable kit for determination of arsenic in groundwater, nanocomposites for molecular recognition, etc.

### Electrometallurgy

CECRI has developed a number of technologies for electrohydro- and electrolyro-metallurgical processes. An important contribution relates to recovery of gallium from Bayer liquor. Other notable technologies include those for regeneration of spent PCB etchants and simultaneous recovery of copper, production of high-purity electrolytic manganese dioxide, recovery of tungsten as ammonium paratungstate from tungsten scrap, production of magnesium from magnesite and seabitterns, non-carbon anodes for eco-friendly aluminum electrolysis, high-purity calcium, production of misch metal, etc.



Polymer Electrolyte Fuel Cells/Stacks



Aligned Carbon Nanotube Bundles

## Electrochemicals

Technologies for a variety of organic and inorganic chemicals have been developed at CECRI. Particular mention must be made of research in areas such as hydrofluorocarbons, perfluorocarbon chemicals, electro-fluorination, electrochemistry of metals and semiconductors in fluoride media, titanium substrate insoluble anode (TSIA), and catalytic electrodes and cation exchange membranes for chlor-alkali and other industries. The development of TSIA brought about a technological revolution in the electrolytic production of chlorates.

CECRI has also developed a number of gadgets for domestic/community/industrial use such as PEM-based hydrogen generator, electrochemical de-fluoridator and electrochemical de-arsenator.

## Electrochemical metal finishing

Some of the major programmes that CECRI has undertaken in the area of industrial metal finishing include cadmium plating on maraging steel parts of SARAS aircraft, electroplating of cadmium on light combat aircraft uplock components made of maraging steel, minimization of waste and recovery of reusables in plating industries, plating on aluminum alloy component hardware used in satellites, electrodeposition of aluminum from organic bath, hydrogen embrittlement-free cadmium plating on maraging steel, cadmium plating over tungsten alloy, high-efficiency etch-free chromium plating, hard chromium plating, anodizing of aluminum, titanium, etc., electropolishing/coloring of aluminum and stainless steel, electrodeposition of nanocrystalline metals, polymer coatings on anodized aluminum, etc.

## Fuel cells

CECRI is one of the nodal laboratories for R&D on hydrogen-based fuel cells. Such an R&D program is seminal for the country since hydrogen has come to be seen as the ultimate fuel for the future. In a short span of two years, CECRI developed and demonstrated self-sustainable polymer electrolyte fuel cell stacks for portable power applications, clearly establishing its capability to fructify a concept into a product.

Based on this noteworthy contribution, prestigious clean energy projects for cutting-edge R&D on hydrogen-based fuel cells and next-generation lithium batteries have been awarded to CECRI. CECRI has also developed a 5-kW capacity PEM electrolyzer capable of delivering pure hydrogen. The main advantage of the unit is that the hydrogen generated can be pressurized in the electrolyzer itself.

## CECRI and Society

As part of its human resource development programme, CSIR-CECRI runs a unique B.Tech. course in Chemical and Electrochemical Engineering supported by the Anna University.

CSIR-CECRI also organizes national and international conferences for the dissemination of scientific knowledge with the help of an independent professional organization of Society for Advancement of Electrochemical Science and Technology (SAEST).

It is also alive to societal obligations and participates in activities such as entrepreneur development and CSIR's youth development programme. C S I R - CECRI is a recipient of several technology awards for its telling service to both Indian and global industries.



On-line Health Monitoring System for Cable-Stay Bridge on Yamuna River

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Appointments

## Dr. Vijayamohan K. Pillai gets additional charge as Director CSIR-NCL



Dr. Vijayamohan K. Pillai, a distinguished material chemist, has taken over as the Director of CSIR-National Chemical Laboratory, Pune on 1 June 2015. Dr. K. Vijayamohan is the Director of CSIR-CECRI, Karaikudi and will be holding additional charge of CSIR-NCL.

Dr. Vijayamohan started his career at CSIR-NCL in April 1991 and rose to become an outstanding scientist in June 2010. He left CSIR-NCL in April 2012 to join CSIR-CECRI as Director.

Dr. Vijayamohan completed B.Sc. and M.Sc. degrees from the University of Kerala in 1980 and 1982, respectively, and obtained his Ph.D. in Electrochemistry/Materials Science from the Indian Institute of Science, Bangalore in 1991. He has huge experience of teaching and has been involved in research focused on electrochemistry,

materials chemistry and energy storage that cover sensors, nanoclusters, self-assembled monolayers, carbon nanotubes, graphene, hybrid materials, fuel cells, batteries and ultracapacitors.

Dr. Vijayamohan has published more than 220 research papers in international peer reviewed journals and has supervised 17 Ph.D. theses. He also has 26 patents to his credit. Dr. Vijayamohan is a member of editorial boards of several reputed journals, academies, committees and councils.

Dr. Vijayamohan is also the recipient of many prestigious awards including Medals of the MRSI and CRSI. He is a fellow of the Indian Academy of Sciences from 2008. He has authored a book *Functional Materials: A Chemist's Perspective* and contributed five chapters to different books.

## Dr. A. Ajayaghosh takes over as CSIR-NIIST Director



Dr. A. Ajayaghosh, CSIR Outstanding Scientist (Scientist H) in CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), assumed charge as Director of CSIR-NIIST on 8 June 2014. Dr. Ajayaghosh took over from acting Director Dr. Gangan Prathap.

Born in Kollam, he completed his B.Sc. from the University of Kerala and did his M.Sc. and Ph.D. at Calicut University. Dr. Ayyappan Pillai Ajayaghosh is an internationally acclaimed supra-molecular

chemist. The research findings of Dr. Ajayaghosh have wide ranging scope in applications such as sensing of biologically relevant cations, imaging of certain metabolites in cells, in clinical diagnostics and in the fabrication of organic electronic devices. Currently, Dr. Ajayaghosh is deeply involved in exploring his findings for applications in counterfeit prevention, authentication of documents, and in non-invasive diagnosis of disease markers.

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