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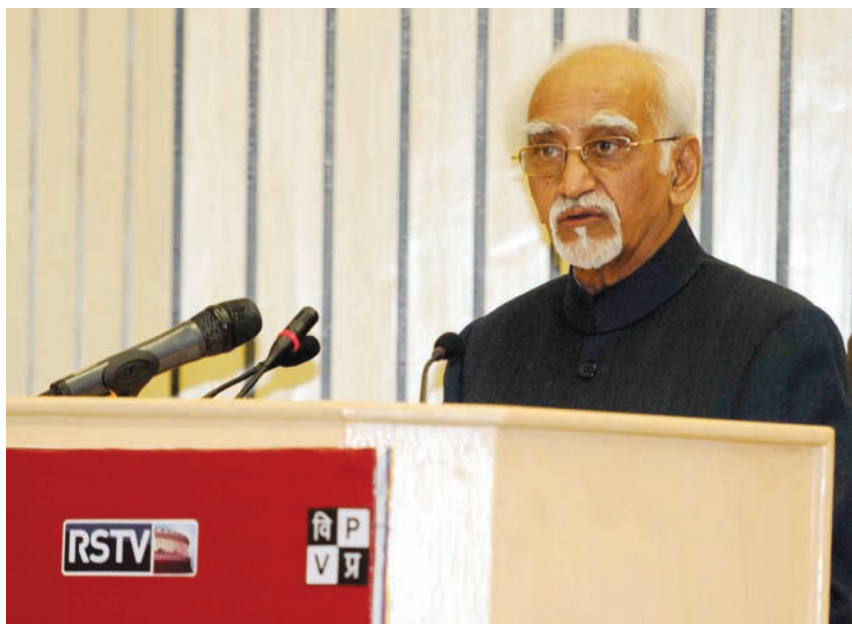
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Happy New Year
CSIR News Wishes
its contributors and readers
a very happy
and prosperous 2016

In The News

Vice President of India Inaugurates Panel Discussion on Scientific Temper Organised by CSIR-NISCAIR



Shri M. Hamid Ansari, Hon'ble Vice President of India, addressing the gathering after launching of new look Rajya Sabha TV and inaugurating a panel discussion on "Scientific Temper"

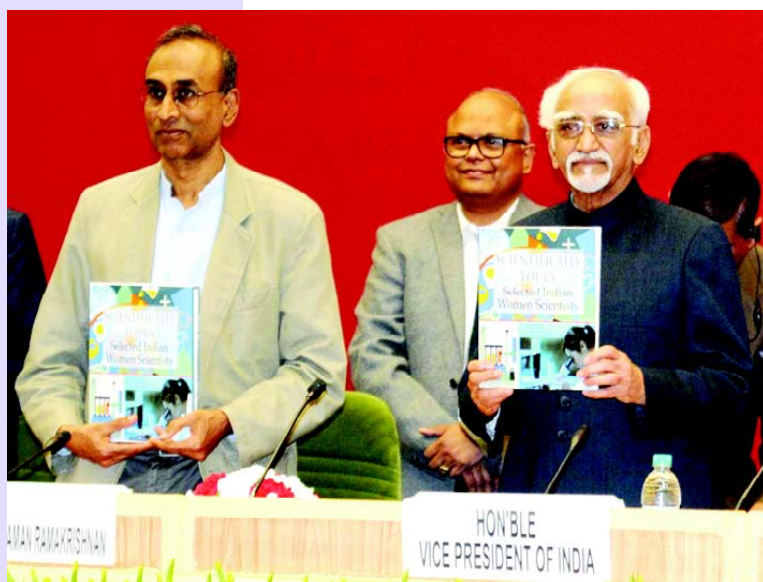
EMPHASIZING that scientific temper is a prerequisite for innovation and research, the Vice President of India, Shri Hamid Ansari, rued the lack of scientific temper in our daily life. The Vice President was inaugurating a panel discussion on

Scientific Temper: A Prerequisite for Knowledge-based Society organised by the CSIR-National Institute of Science Communication and Information Resources (NISCAIR), New Delhi in collaboration with Rajya Sabha TV and Vigyan Prasar.

Lamenting the “intolerance to criticism and questioning” and lack of scientific temper in society, Shri Hamid Ansari said, “Most parents don’t like children asking questions, and in schools, from nursery to high school, teachers frown upon children raising questions.” He also lamented that, “It is strange that in an India committed to modernity, we have a large number of faith or tradition-based television channels but none exclusively devoted to science or science-mindedness.”

Apart from inaugurating the panel discussion on scientific temper at Vigyan Bhawan in New Delhi on 10 January 2016, the Vice President also released two books based on interviews of some of the most eminent scientists in the country telecast on Rajya Sabha TV (RSTV) as part of the *Eureka* and *Scientifically Yours* programmes. The books are a collaborative effort of the CSIR-National Institute of Science Communication and Information Resources (NISCAIR), Vigyan Prasar and RSTV. The books cover the lives and achievements of selected living Indian scientists and their contribution to Indian science.

Continuing the Vice President’s thought forward, Prof. Raghavendra Gadagkar, President of the Indian National Science Academy (INSA), who was one of the experts invited for a panel discussion on *Scientific Temper: A Prerequisite for Knowledge-based Society* following the book release function, said that we are burdening our children with scientific facts rather than making them aware of the method of science which involves questioning and re-questioning. Empowered with the capability to question people can find their own



Shri M. Hamid Ansari, Hon'ble Vice President of India, releasing the book 'Scientifically Yours'



Releasing the book brought out by CSIR-NISCAIR, Vigyan Prasar and Rajya Sabha TV, from right: Vice President of India, Shri M. Hamid Ansari; Dr. R. Gopichandran, Director, Vigyan Prasar; Prof. Venkatraman Ramakrishnan, Nobel prize winner and President of the Royal Society; Shri Gauhar Raza, Chief Scientist, CSIR-NISCAIR, and Shri Gurdeep Sappal, CEO, Rajya Sabha TV



Clockwise from top left: Prof. Venkatraman Ramakrishnan, Dr. Anil Kakodkar, Prof. Raghavendra Gadagkar, Shri Gurdeep Sappal, Shri Gauhar Raza and Dr. Indira Nath

answers to questions and situations such as when idols start drinking milk, he said.

However, when questioning is suspended different kinds of dogmatic thoughts and ideologies pervade the social space. And when such dogmatic ideas or political ideologies are introduced into science, they drag down science with them, said Nobel Laureate Dr. Venkataraman Ramakrishnan, who was also a part of the discussion. He cautioned that there are elements who

would try to inject non-scientific ideas into science and it was for Indians to decide how best to deal with the situation.

The quest for the development of a scientific temperament in the country's citizens will have to begin in the schools if scientific temper has to truly pervade the wider social spaces. Therefore, our textbooks, our educational curriculum and our teaching methods will have to be suitably aligned to create curiosity in the minds of children and also motivate them to look for answers.

Excerpts from the Vice President's Address

“The theme of our discussion is scientific temper. It is taken for granted, yet inadequately explored. What do the two terms – ‘scientific’ and ‘temper’ – actually mean? Any dictionary would tell us the meaning of temper; it means a frame of mind or mental disposition. The same dictionary tells us that ‘scientific’ means seeking knowledge through systematic observation and experiment. Its opposite is ‘unscientific’; it denotes acquisition of knowledge by methods that are scientific.

Thus, the simple meaning of scientific temper is a frame of mind that trains itself to seek knowledge by scientific methodology and refrains from acquiring it through other means. Its emphasis is on the *process* as well as the *product*.

Scientific temper means that knowledge based only on authority or legend – of superiors, elders, tradition or convention – is insufficient unless it is supported by a rational process of reasoning based on facts. Scientific temper, thus, is an attitude that involves the application of logic. Discussion,

argument and analysis are vital parts of this approach. It cannot be authoritarian and must submit to reasoning based on facts and logic.

It was Jawaharlal Nehru who introduced the term in our public discourse. The *‘mere applications of science and technology will not be a sufficient condition’*, he wrote, adding that what is needed is *‘the scientific approach, the adventurous and yet critical temper of science, the search for truth and new knowledge, the refusal to accept anything without testing and trial, the capacity to change previous conclusions in the face of new evidence, the reliance on observed fact and not on pre-conceived theory, the hard discipline of the mind — all this is necessary, not merely for the application of science but for life itself and the solution of its many problems.’*

Scientific temper is characterized by traits like a healthy skepticism, universalism, freedom from prejudice or bias, objectivity, open mindedness, humility, willingness to suspend judgment





without sufficient evidence, rationality, perseverance and positive approach to failure. A person having scientific attitude uses the method of science in his/her daily normal decision making process.

One of the objectives of our Constitution is to make scientific temper the basis of all social interaction. This is spelt out in Article 51A: “*it shall be the duty of every citizen of India to develop scientific temper, humanism and spirit of inquiry and reform*”.

Why was this done?

The answer is evident. We live in the age of science. Science has become the most powerful driver of growth and development. No aspect of human life remains untouched by science. The answers to humanity’s greatest challenges today - disease, hunger, environmental degradation, climate change, energy requirements and search for new technologies to overcome them - rest in our better understanding of science.

This has practical implications:

- In a competitive economy, there will be much greater demands on the Scientific and Technological

capabilities of the country. We will need more, and better, innovations in order to remain competitive as we aspire for faster, sustainable and inclusive growth.

- Public acceptance of scientific temper and development of a critical and inquisitive attitude is a precondition for fostering and sustaining the cultivation of innovations and scientific research.
- We need to create the right ambiance and structures to encourage science research and innovation. A pre-requisite is the need to develop an enquiring attitude and an analytical approach that leads to rational thinking and the pursuit of truth without prejudice.

This should be evident to all. In reality, it is not so. Much too often there is a lack of scientific temper in our daily life. Allow me to cite a few situations:

- In our family life, we do not approve of questioning. Most parents do not like children asking questions. In schools, from nursery to high school, teachers frown upon children raising questions. In colleges and universities, asking questions is often considered ‘cheeky’ and an attempt by the student



to cast doubt on the knowledge of the teacher.

- The same holds good for social life. It is considered ‘disrespectful’ to question an elder, a superior or a leader.
- This frame of mind is reflected in our attitude to matters of social custom, inherited tradition and faith. Attempts to separate myth from fact, history from mythology, belief from scientifically verified facts, are often frowned upon. Pursuant to it, occult is dubbed scientific and superstition as ‘culture’.
- Such approaches have often taken unpleasant and violent turn: books have been banned or withdrawn from circulation, libraries have been burnt, individual dissenters ostracized or killed, social peace disturbed and violence inflicted on citizens.
- In each of these cases, the working assumption is that questioning will hurt sentiments, damage or destroy existing order or structures, undermine faith, disrupt social order.

Based on these dubious foundations, irrational faiths and beliefs based on unscientific prejudices and habits still persist. There is intolerance of criticism and questioning. It is ironical that the latest Information Technology tools are used for propagation of anti-science beliefs.

It is strange that in an India committed to modernity, we have a large number of

faith or tradition-based television channels but none exclusively devoted to science or science-mindedness. It is also paradoxical that at times, even scientists succumb to practices that derogate from scientific temper. These practices raise a question: can one be scientific and unscientific, rational and irrational, logical and illogical at the same time?

It is here that education has to play a critical role. Unfortunately, our education system is insufficiently equipped to inculcate Scientific Temper in young minds. Over the years, the quantum of scientific information in the country has increased but has not brought about science-mindedness in sufficient measure.

The use of mass media as a means of transmitting science related information is perhaps the most important bulwark in our fight against ignorance and irrationality. The media, given its privileged position, has a responsibility to challenge the rampant obscurantism and superstition that afflict our society.

I am very happy that the Rajya Sabha TV, which has cast itself in the role of a knowledge channel and NISCAIR, which has been in the business of science communication for the past six decades, have taken this initiative. I hope that the books launched today will help in popularizing science and the panel discussion, with the participation of several luminaries, will also contribute to this cause.”

CSIR-CSIO and TBRL Developing Smart Anti-tank Mine for Army

In one of the first projects of its kind in the country, the Central Scientific Instruments Organisation (CSIO), Chandigarh is developing a smart anti-tank mine for the Army jointly with the

Terminal Ballistics Research Laboratory (TBRL).

The project that is expected to take about four years to complete, will result in an “off-route mine”, which will not



be buried in the ground like conventional mines, but mounted on a tripod and concealed alongside roads and possible routes. The mines are even being programmed to target only a particular type of vehicle based on its unique seismic and acoustic signature.

The portable mine that can be

deployed in different kinds of terrain, will lie dormant in a sleep mode, with a low power sensor observing the designated area. Once the potential target has been tracked and identified, the sensor will send an “awakening” call to the main system activating it and the mine will detonate.

CSIR-CSIO develops Fibre Optics Fencing System with Negligible False Alarms

Currently available detector devices have a tendency to give false alarms during inclement weather and due to other reasons as well. Now, scientists at the Central Scientific Instruments Organisation (CSIO), Chandigarh, have developed a fibre optics fencing system to enable efficient detection of intrusion on the geographical borders. The indigenous smart fence is reliable with high detection rate, immune from electrical interference or weather disturbances, and has a negligible false alarm rate.

Currently available fencing systems often give false alarms making it easier for infiltrators to cross the borders. However, the new prototype of smart fence has a 100 per cent detection rate,

negligible false alarm rate and low sensitivity to weather conditions. It will only respond to enemy intrusion and alarm activation will only be by direct assault and unlike other systems, it is not prone to short circuits.

Comprising a field fibre net, any attempt to cut, tamper or climb the net causes intensity variation due to disturbances created in the fibre which trigger the alarm. The system can be installed in various areas, be it underground, underwater, combustible areas, desert areas and snow-bound areas. It is also safe in high EMI environment and withstands UV radiation. Apart from being safe and easy to install, it is also corrosion-resistant, dust-proof and weather-proof.



The Zone Processing Unit

R&D Highlights**Products developed at CSIR-CEERI under Hybrid Microcircuits activity****Sensor Electrodes for Milk Analyzer for REIL, Jaipur:**

One thousand (1000) sensor electrodes were developed for Milk Analyser as per the requirement of Rajasthan Electronics & Instruments Limited (REIL), Jaipur. The electrodes were developed using thick film alumina technology. They will be used in milk analysers to test the adulteration. They are highly rugged and reliable having three working electrodes of Au, Au-Pt and Pd-Ag, and 1 reference electrode of Pt on the substrate as shown in Fig. 1.

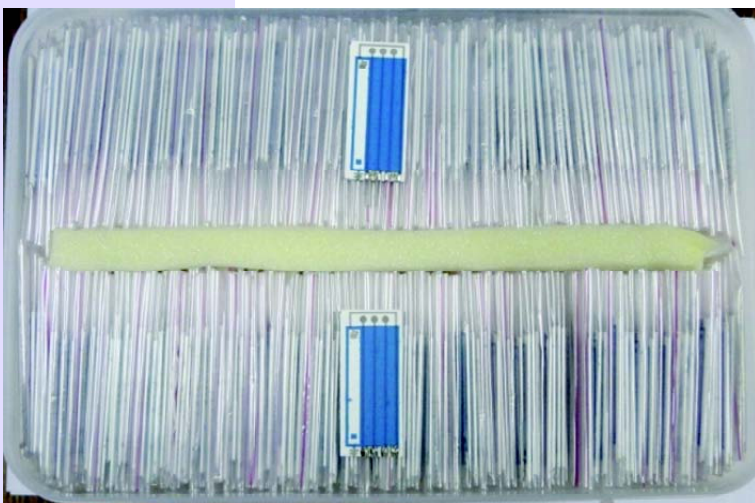


Fig. 1: Sensor electrodes developed for REIL, Jaipur

Packaged ISFET Microsensors:

Packaging of ISFET microsensors was completed using thick film alumina technology. ISFET devices were wire-bonded followed by die attachment process. Dam-and-fill technique was used for exposure of sensing layer and encapsulation of the remaining part of the device. Packaged microsensors (Fig. 2) have been delivered to user group of the institute. Packaged ISFET microsensors

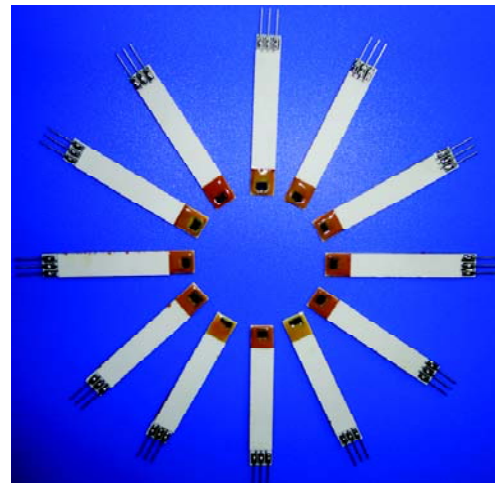


Fig. 2: Packaged ISFET Microsensors

were tested and the test results met the user requirement.

Packaged EGFET Microsensors:

EGFET microsensors with different sensing layers viz. AlN, SnO₂ and ZnO were packaged as shown in Fig. 3. Thick film alumina technology was used for conductor printing. Device attachment and wire attachment processes were carried out. The microsensors were delivered to the user group and they are under testing.

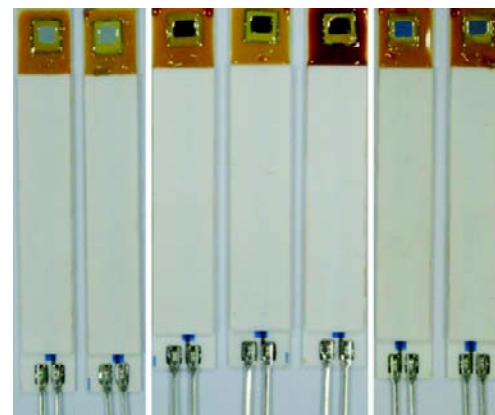


Fig. 3: Packaged EGFET Microsensors

Packaged Pressure Sensors (On Ceramic Headers): Ceramic headers were developed using thick film technology. Die bonding and wire bonding of pressure sensor devices were done. Dam-and-fill technique was used for encapsulation. Packaged sensors (Fig. 4) were handed over to the MEMS group of our institute.

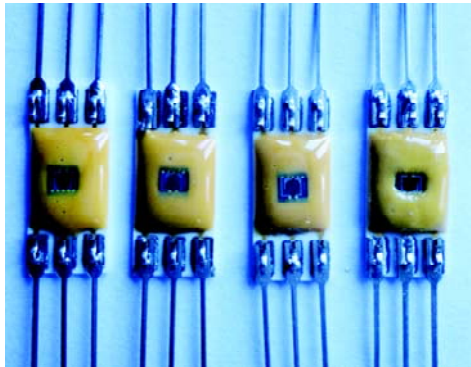


Fig. 4: Packaged Pressure sensors

Pressure Sensor for High Pressure Applications: Pressure sensors for high pressure applications were packaged using LTCC technology. Base for mounting the sensor and electrical interconnections were developed in LTCC. The sensor was die bonded and wire bonded on the LTCC package (Fig. 5). Metal lid with pipe assembly and

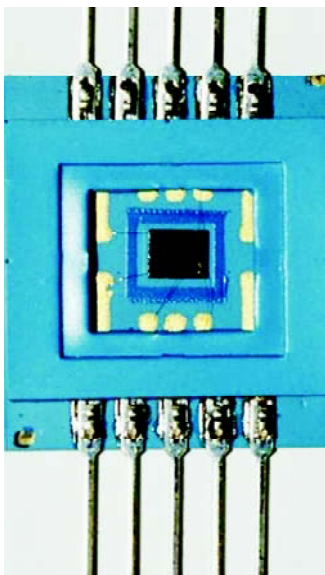


Fig. 5: Pressure Sensor mounted on LTCC Package

L-shaped tubing (Fig 6) for applying the input pressure were also developed.

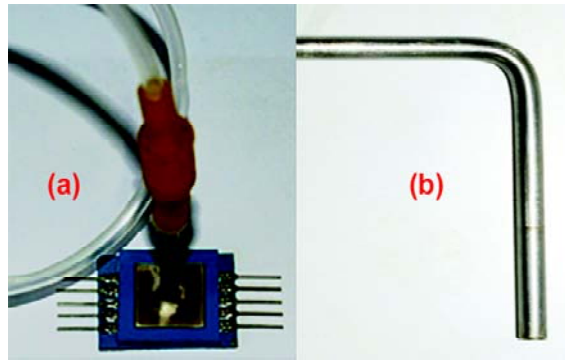


Fig. 6: (a) Metal lid with pipe attachment for applying pressure (b) L-shaped tube for input pressure

LTCC Package for Barometric Pressure Sensor: Package for barometric pressure sensor was fabricated using LTCC technique. Lid with an opening was provided for exposure of the sensing area. Two-step cavity was also developed in LTCC for hermetic sealing of the lid. Leads for electrical interconnections (Fig. 7) were attached using reflow soldering process.

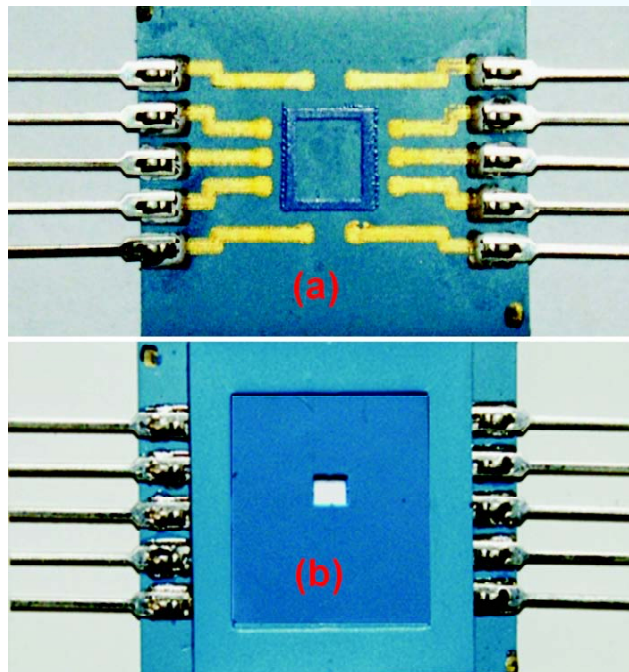


Fig. 7 (a) LTCC base for Barometric Pressure Sensor (b) LTCC Package for Barometric Pressure Sensor



LTCC Package for Differential Pressure Sensor: Substrate fabrication with dedicated hole was completed for packaging of differential pressure sensor. It was to ensure the exposure of diaphragm from both sides. Cavity has also been fabricated as depicted in Fig. 8. Packaging of differential pressure sensor is in progress.

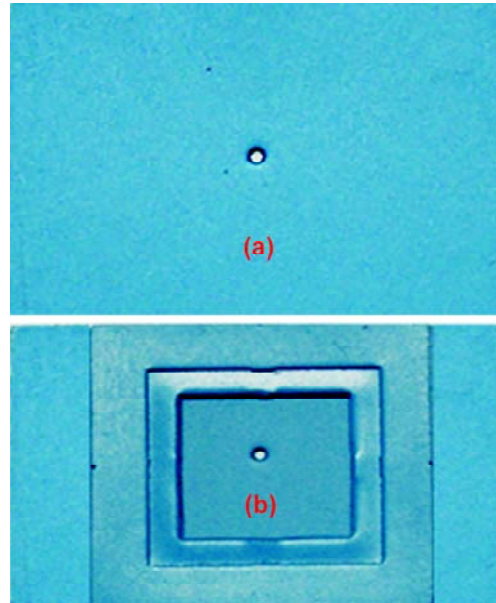


Fig. 8 (a) LTCC base for Differential Pressure Sensor (b) LTCC base with cavity for Differential Pressure Sensor

Dedicated LTCC Package for Microhotplate Packaging: The base was fabricated using LTCC technology.

LTCC package with perforated lid in LTCC and metal were developed for dedicated packaging of gas sensor devices. The array of holes in LTCC was made using via-punching at green stage. The punched tapes were then stacked, tagged and laminated. Pre-cutting was done before firing. Customized packages (Fig. 9) with specific number of holes and hole diameter were developed.

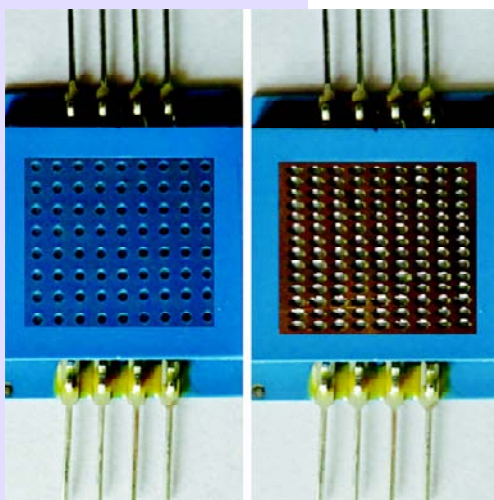


Fig. 9: LTCC package with perforated lid in LTCC and metal

Patterning with Laser Ablation Technique for LTCC Sensor Module: Packaging of pressure sensor and the related ASIC was completed earlier in a package size of 25 mm x 25 mm (Fig. 10). In the current package, experimentation for patterning of conductor tracks using laser ablation technique was done. It reduced overall package size to 8 mm x 8 mm (Fig. 11). The line width and line spacing in the current package were reduced to 50 μm as compared to 200 μm in the earlier one. The overall area was reduced by a factor of 10, which in turn reduces the weight, size and volume of the package. The size reduction would be helpful in reduction of parasitics in the electronics part of pressure sensor module.

LTCC based Packages for Accelerometer Packaging: Proper displacement of proof mass in accelerometer device essentially requires a cavity in LTCC substrate. A dedicated

Parameter	Current Package	Earlier Package
Overall Substrate Size	8mm x 8mm	25mm x 25mm
Line Width	50 μm	200 μm

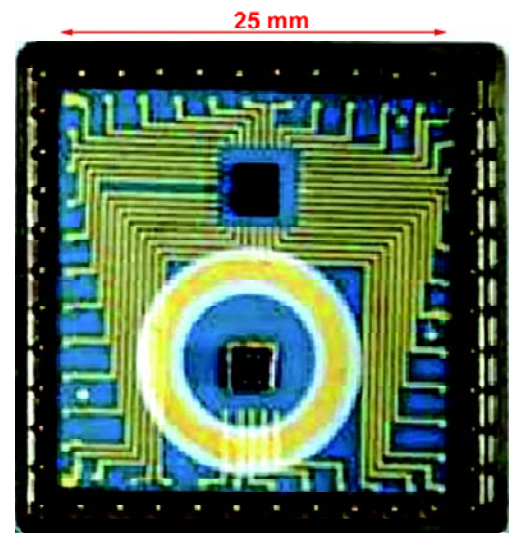


Fig. 10: Pressure sensor module developed using conventional screen printing process

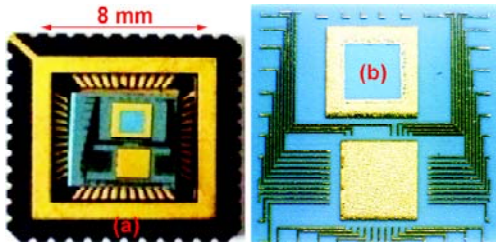


Fig. 11: (a) Pressure sensor package using Laser ablation technique (b) Zoomed image of substrate for pressure sensor packaging (Laser micromachining on CEERI samples courtesy: M/s Laser Science Services Pvt. Ltd., Mumbai)

cavity using slit cutting was provided for the displacement of proof mass. Depth of cavity was as per the user requirement, optimised by tape thickness and shrinkage along Z-direction. LTCC frame and lid were fabricated for the protection of sensor from external environment. Die bonding and wire bonding of accelerometer devices were done (Fig. 12). Packaged 1-axis accelerometer using LTCC lid is shown in Fig. 13.

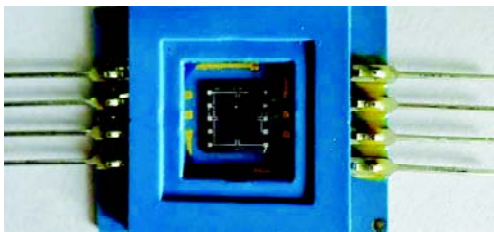


Fig. 12: Die bonded and wire bonded device in the LTCC package

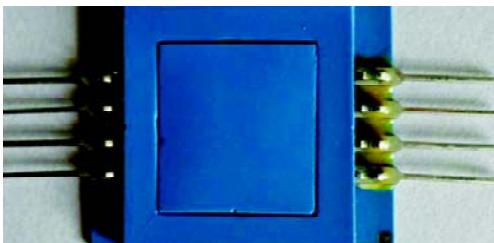


Fig. 13: Packaged accelerometer

LTCC Packaging for Magnetometer: LTCC package for magnetometer packaging was developed (Fig. 14). Glass lid was made and used to test the packaged device using LDV. The device was tested before and after packaging.

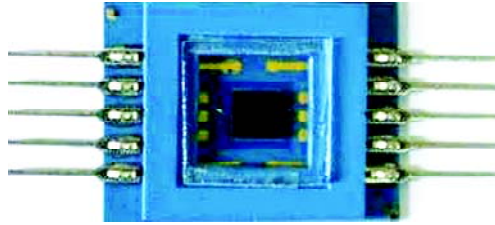


Fig. 14: Packaged magnetometer using glass lid

LTCC Packaging for Gyroscope:

LTCC package for gyroscope packaging was developed. Fig. 15 shows LTCC packaged gyroscope. The packaged device was tested using LDV with a glass lid attached on the package. The device was tested before packaging and the test results matched even after packaging.

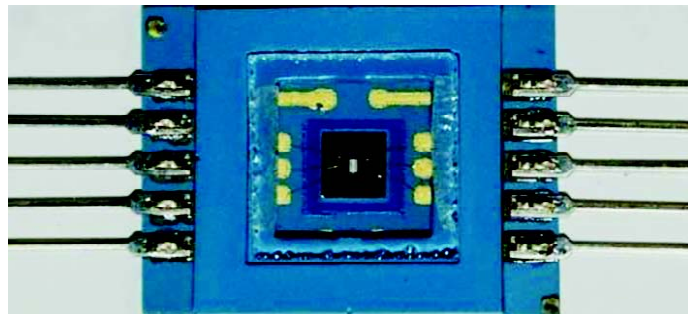


Fig. 15 : Packaged gyroscope with glass lid

Laser Ablated Microhotplate:

Patterning of thick film platinum using laser ablation technique was completed (Fig. 16). Three different geometries for (meander 1, 2 and 3) heater were patterned. Fig. 16(b) shows pattern printed on LTCC substrate before laser ablation process. Interdigitated electrodes were patterned on the back side.

Vacuum Hermetic Packaging Experiments:

Metal lid with pipe assembly was developed and used for vacuum packaging. Hermetic sealing of the assembly was provided with the LTCC package. Hermeticity was tested using leak detector in which Helium gas was sprayed on the sealed parts. After desired



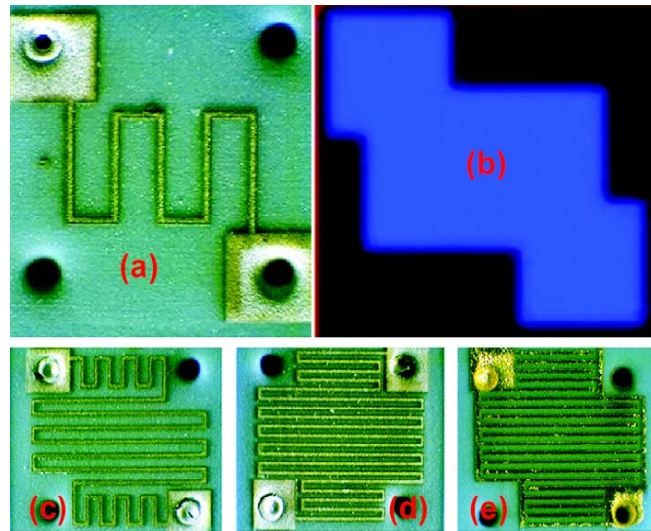


Fig. 16: Laser Ablated Microhotplate (a) Meander 1 (b) Pattern printed before laser ablation (c) Meander- 2 (d) Meander-3 (e) Electrode side-Au Laser micromachining on CEERI samples. Courtesy: M/s. Laser Science Services Pvt. Ltd., Mumbai and M/s. Vertex Global, Mumbai

packaging, where vacuum is required. LTCC package sealing under vacuum is shown in Fig. 18.

3-Axis Packaging using LTCC:

Packaging of 1-axis sensitive sensors to make them work in 3-axis has been explored. LTCC package for 3-axis packaging was designed and developed. Various stages of the developed package are shown in Fig. 19. The package accommodates three 1-axis sensitive devices; which were attached on three different orthogonal directions of a cube assembly. 3-axis package

vacuum (in the order of 10^{-3} torr) the pipe was crimped (Fig. 17). The developed technique can be used in any sensor

in LTCC is in Fig. 20 (a) and in Fig. 20 (b) (1, 2 and 3 highlighted) indicate the three-axis of sensing.

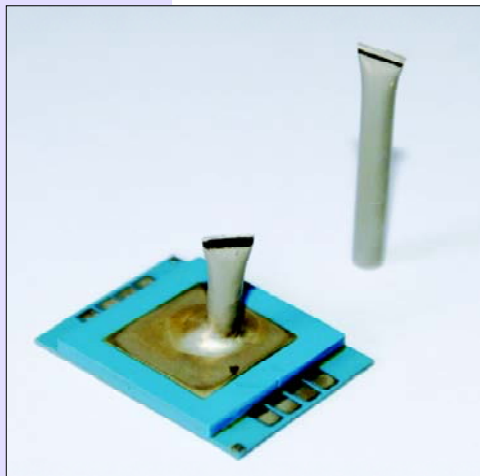


Fig. 17: Vacuum hermetically sealed package

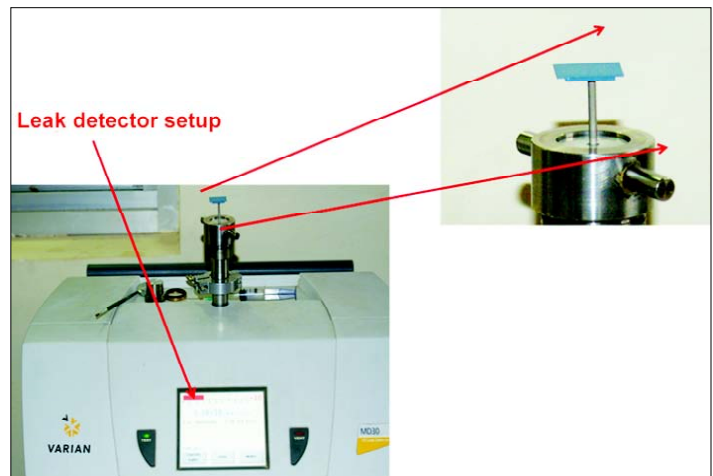


Fig. 18: LTCC package sealing under vacuum

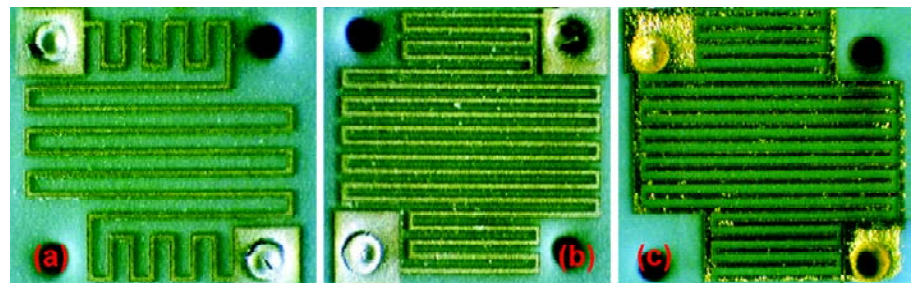


Fig. 19: (a) LTCC substrate with cavity (b) LTCC package with frame, (c) LTCC package with lid

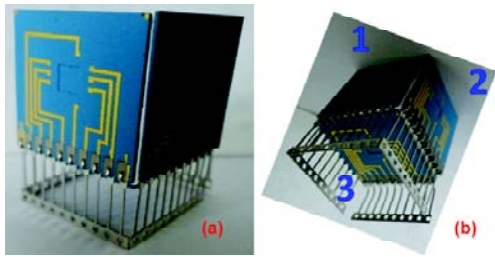


Fig. 20: 3-Axis Package in LTCC
(a) side view (b) Bottom view

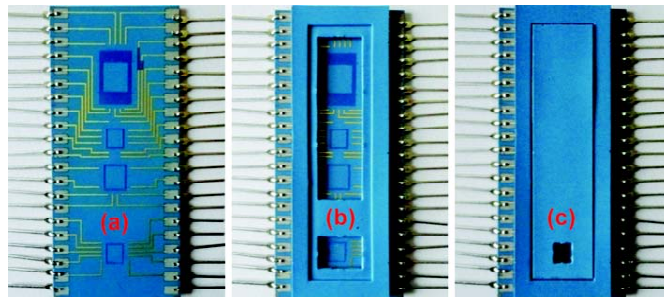


Fig. 21: (a) Fabricated LTCC Base (b) Integrated LTCC Package (c) LTCC package with lid

Integrated Package in LTCC: LTCC-package for integrated packaging of four sensors viz. Accelerometer, Gyroscope, Magnetometer and Pressure sensor was designed and developed. 42 pins have been attached with the package using reflow soldering technique. The design accommodates accelerometer of two different dimensions viz. 10 mm x 7 mm and 6 mm x 6 mm. gyroscope with 8/10 I-O pins and two Magnetometer devices (at a time) can be accommodated. An isolation wall was designed at green stage within the frame so that pressure sensor can be isolated from other devices viz. accelerometer, gyroscope and magnetometer. For barometric pressure sensor an opening in cavity was designed to give exposure to the environment. Three stages of the integrated LTCC-package are shown in Fig. 21.

Experiments for Packaging Using 3-D Printing: Experiments for packaging of sensors using 3-D printing were performed in co-ordination with CSIR-CEERI Chennai Centre. Ceramic headers, developed both thick-film alumina technique, were used for pressure sensor packaging. The active area can be exposed by a slit developed using 3-D printing. Packaged Pressure sensor using 3-D printing is shown in Fig. 22. Packaging of ISFET device was also completed using 3-D printing (Fig. 23).

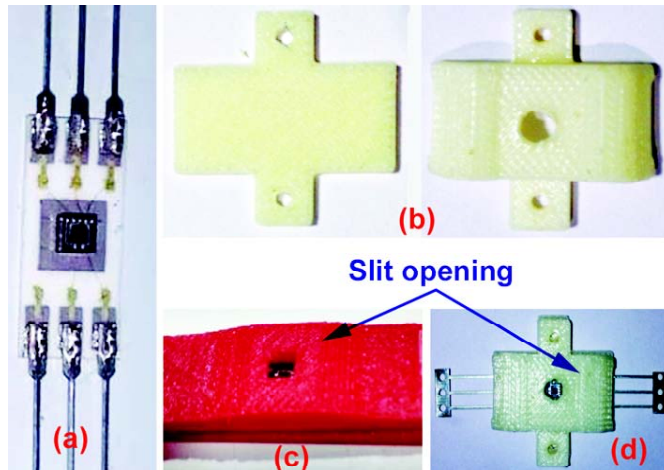


Fig. 22: (a) Pressure sensor before 3D printing mounted on ceramic header; (b) stages for packaging of pressure sensor using 3-D printing; (c), (d) Packaged sensor using 3-D printing

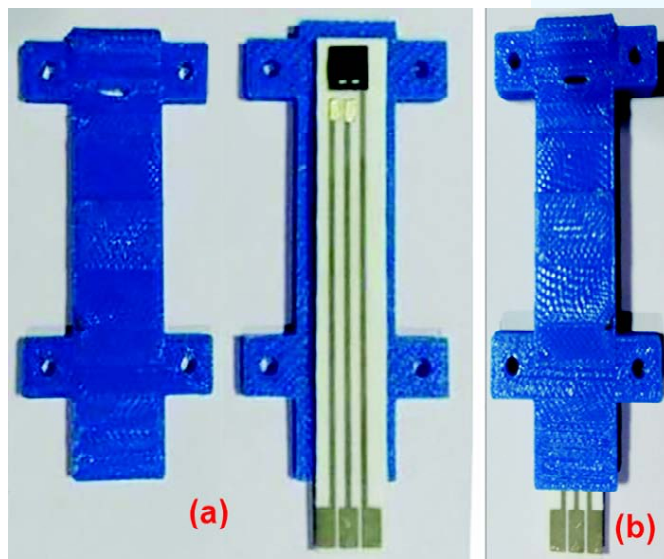


Fig. 23: (a) Stages for packaging of ISFET using 3-D printing
(b) Packaged ISFET using 3-D printing

MoUs/Agreements

CSIR-CSMCRI signs MoU with Bhavnagar District Administration

In a commitment to serve the society, CSIR-Central Salt and Marine Chemicals Research Institute (CSIR-CSMCRI), Bhavnagar, Gujarat signed a memorandum of understanding with the District Administration, Bhavnagar, Govt. of Gujarat on 26th September 2015, the CSIR Foundation Day.

CSIR-CSMCRI is involved in applied research and development aspects of salt and marine chemicals, desalination, reactive polymers, wasteland development, marine biotechnology and ecology, inorganic materials and catalysis since more than 60 years. CSIR-CSMCRI has developed an innovative mobile desalination and water purification unit consisting reverse osmosis, electro dialysis and ultrafiltration, equipped with water testing apparatuses.

The institute has established many ultrafiltration units in different states of the country including Odisha and Uttarakhand for providing safe drinking water to the peoples. Iron and iodine are essential elements for human body, deficiency of both vital elements causes

health disorders including anemia and goitre that have serious detrimental effects on the economic and social development of entire population. An innovative route for fortification of salt with iodine and iron to develop double fortified salt (DFS) using inorganic matrix compound, which exhibits white colour and retains its concentration intact over a long period of time to control the problems of iodine deficiency and anemia has been developed by CSIR-CSMCRI.

The institute has done exhaustive work on production, quality assessment and grade improvement of *Jatropha* biodiesel. Biodiesel manufactured by the institute has been tested and okayed by a variety of national and international agencies for its grade and standard. The Institute has isolated a variety of beneficial nutrients and manufactured fertilizers from sea weeds like *Kappaphycus alvarezii* and *Gracilaria edulis* that are very economic and have great impact on health and agriculture.

For the betterment of the people of Bhavnagar District in the field of skill building and livelihood, clean city and village initiatives, tourism promotion and all other activities for the welfare of citizens, both the authorities have come together. In consideration of the mutual covenants set out, CSIR-CSMCRI and district administration of Bhavnagar have agreed to establish water purification plants for anganwadis and schools, DFS for mid-day meals of school children, cultivation and processing of seaweeds for coastal communities, waste to energy initiative, advancement of the highly skilled village, prospects and intent for a public transport tourist vehicle with biodiesel as its fuel for the heritage circuit of the city areas of the Bhavnagar district.



CSIR-CGCRI organizes IWPFA-2015



On the dais (left to right) Dr. K. Muraleedharan, Director CSIR-CGCRI, Dr. V.K. Aatre, Shri Kamal Dasgupta and Dr. M.C. Paul

CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata organized the International Workshop on Emerging Areas in Photonics and Future Applications (IWPFA-2015) during 7-12 December 2015. The Workshop was particularly timely since the UN General Assembly had proclaimed 2015 as the International Year of Light and Light-based Technologies (IYL 2015).

After the lighting of the ceremonial lamp, Dr. K. Muraleedharan, Director CSIR-CGCRI, warmly welcomed the distinguished delegates and all other participants and said that this was a very proud moment for the institute as it underlined the leadership role it has played in research on light and light-based technologies. He reiterated the UN's recognition of the importance of raising global awareness about how light-based technologies promote sustainable development and provide solutions to global challenges in energy, education, agriculture and health. He also mentioned that 2015 marked the 100th anniversary of Einstein's General Theory of Relativity.

In addition, last year's Nobel Prize in Physics had been awarded for research on light. Isamu Akasaki, Hiroshi Amano and Shuji Nakamura received the Nobel Prize for the "invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources." Thus, light, and light-based technologies have held the centre-stage of scientific R&D for years!

CSIR-CGCRI has had a long heritage of pioneering work in this field. This year, the institute won the CSIR Technology Award for development of completely packaged all-fiber supercontinuum light source. CSIR-CGCRI's contribution is being recognized but we have more to deliver, he said. This includes the novel use of fiber in strategic as well as societal sectors. The purpose of organizing IWPFA-2015 was to invite the best global experts in the field to come and interact with the young students and researchers so that they may be motivated to take on the challenging problems of the future. He concluded with the hope that IWPFA-2015 would help seal new collaborations.

Chief Scientist Shri Kamal Dasgupta said that research on light had enormous potential and there was no “last word” in the field. He anticipated that the students would make good use of the opportunity especially that of the supervised visits to the laboratories where they could see firsthand the facilities for making fibers.

Dr. Shyamal Bhadra, Chief Scientist, Fiber Optics and Photonic Laboratory, CSIR-CGCRI, introduced the Chief Guest Padma Bhushan awardee Dr. Vasudev Kalkunte Aatre, former Head of the Defence Research and Development Organisation (DRDO) and Scientific Advisor to the Defence Minister (Raksha Mantri).

In his address Dr. Aatre called for the setting up of a National Photonics Programme in the country at the earliest opportunity since very few of these technologies are available in useful products currently. He also said that the 20th century taught the 21st what to do. He consolidated his argument with clinching evidence from fields as diverse as communication (when Marconi developed the wireless which has

culminated in the ubiquitous smart-phones of today) to aeronautics (that began with the Kitty Hawk and evolved to include supersonic aircrafts and space shuttles) to robotics, where scientists are now contemplating the creation of compassionate robots that may soon become household names. There is thus no way of knowing just how technology will evolve and where it will go. However, if just two areas had to be singled out for their impact on modern life it would have to be Material

Sciences, which includes metals, composites, ceramics and designer materials now and Micro-miniaturization which includes nano single layer graphene and micro fluidics, which is essentially a lab on a chip. Light-driven microfluidics has huge potential in diagnostics etc., he said.

He pointed out that imagination-driven research at MIT and University of Carolina have resulted in fireflies that glow in different colours and in artificial leaves that act as solar generators. Similar innovative thinking must characterize our research too. Asians dominate R&D in science and technology, he emphasized; we just have to churn the talent. Laboratories have talent. These are high in innovation and discovery but they find it difficult to convert the product to a marketable item. India has to become a knowledge power and this can only happen via S&T. India has enough funds for research and trained manpower too; we just need to channelize it and join it to a national cause. Director, CSIR-CGCRI presented a token of appreciation to the Chief Guest.

The Vote of Thanks was delivered by Dr. M.C. Paul, Principal Scientist.

The Inaugural programme concluded with the release of the Souvenir and a special issue of *Science and Culture*. A cultural programme was also organized in the evening. The theme *Andhokarer Utso Hotay Utsarito Alo* (Light that gushes forth from the source of darkness) was in keeping with the focus on Light at IWPF-2015.

Luminaries in the field delivered their talks to great appreciation. For example, Prof. Gunter Steinmeyer, Max Born Institute, Berlin, Germany spoke on Hollow core fiber architectures for femto-second pulse delivery and pulse compression. Dr. P.K. Gupta, RRCAT, Indore elaborated on “Photonics for



Dr. G. Steinmeyer delivering his talk

health care applications.” Prof. Ajoy Ghatak, Former Professor at IIT-Delhi elucidated on “International year of Light and Fiber Optics: A brief history.”

Dr. Reinhard Caspary, TUB, Germany talked about Polymer optical fiber-fabrication and application.” Prof. Govind P. Agrawal, University of Rochester, USA spoke on “Recent advances in supercontinuum generation.” Dr. K. Suresh Nair, SFO-Technologies Pvt. Ltd., Cochin delighted the audience with his light-hearted but erudite presentation entitled “Take it lightly.”

In all, 21 invited lectures were delivered by celebrated scientists from

India and abroad as well as successful entrepreneurs dealing with light-based technologies. Speakers came from as far away as Russia, Germany, USA and the UK to name a few countries.

IWPFA-2015 touched a chord with the students; more than eighty students from across India participated as did about 20 faculty members from across India and about 15 scientists from CSIR-CGCRI. The students were especially enthusiastic about the laboratory visits and the opportunity to interact with the icons in the field motivated them further. In just six short days, IWPFA-2015, thus touched the future.



Lectures

Golden Jubilee Lecture Series at CSIR-IITR

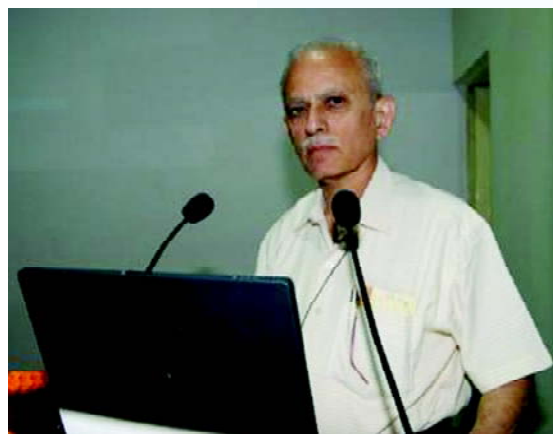
CSIR-Indian Institute of Toxicology Research, Lucknow is celebrating 50 years of its existence. To commemorate the occasion, CSIR-IITR organized the Golden Jubilee lecture series starting August 2015.

The first lecture in the series was delivered by Dr. Baldev Raj, Director, National Institute of Advanced Studies, Bengaluru on 25 August 2015. While delivering the lecture “Energy security – foresight and technologies”, Dr. Baldev Raj exhorted the scientific community to go hammer and tongs in the pursuit of science to lift India from its present position among countries with the lowest innovation index. Dr. Raj firmly believes that India is a country of great rhythm and it is up to us to harness the power of this rhythm to retain the competitive edge and emerge as the world leader.

The second lecture in the series was delivered by Prof. Balram Bhargava, Department of Cardiology, All India Institute of Medical Sciences, New Delhi on 26 September 2015. In his lecture

“Future of health care innovation in India”, Prof. Bhargava exhorted the scientific minds to tap the vast talent pool in the country and the inherent ability to be naturally innovative to address the unmet needs in various sectors. Frugal innovation without compromise on quality is the need of the hour.

The third lecture was delivered by Prof. Bikramjit Basu, Professor at the Materials Research Centre, Indian Institute of Science, Bangalore on 2 September 2015. In his lecture, Prof. Basu said that skeletal disorders continue to be the most widespread problem, particularly with increasing rate of trauma and diseases such as osteoporosis and osteoarthritis,



which often occur in ageing population. Synthetic implant materials serve as the solutions for these problems. He discussed the various challenges in translating lab-scale research to prototype development.

The fourth lecture was delivered by Dr. N.K. Jain, Executive Vice-President,

International Society of Tea Science on 4 September 2015.

In his lecture entitled “Current status and future development of global tea”, Dr. Jain said that though China and India are world leaders in tea production, their exports are dismal compared to leading exporters like Kenya and Sri Lanka. He opined that the tea crop consumes a lot of chemical pesticides, therefore, more efforts are required to reduce the problem of pesticide residues.

In the fifth lecture on 21 September 2015, Prof. R.K. Khandal, President R&D, Indian Glycols Ltd., Noida in his lecture “Food Safety: Challenges and opportunities - an Indian perspective”, said that in India though stringent food safety guidelines exist, the challenge is in their implementation. It is a fact that while the western countries have been successful to a large extent in enforcing food safety guidelines, a lot still needs to be done to achieve the same in the Indian scenario.

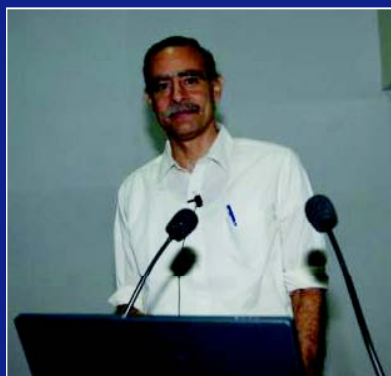
The sixth lecture in the series was delivered by Prof. U.S. Bhalla, Professor and Dean, National Centre for

Biological Sciences, Bangalore on 14 October 2015. Prof. Bhalla in his talk

“Shining light on memory: optical recording and optogenetics” gave a glimpse of some of the phenomena and mechanisms of memory using emerging techniques of optogenetics and optical recording. He emphasized on how brain function and dysfunction can now be studied with a stronger mechanistic perspective using emerging physiological tools.

In his lecture “Affordable point-of-use water purification using nanomaterials”, Prof. T. Pradeep, Department of Chemistry, IIT-Madras on 13 October 2015, said that access to clean water is one of the most important indicators of development. Creation of affordable materials for constant release of silver coins in water is one of the most promising ways to provide microbially safe drinking water for all. Combining the capacity of diverse nanocomposites to scavenge toxic species such as arsenic, lead and other contaminants can result in affordable, all inclusive drinking water purposes that can function without electricity. The challenge in achieving this is the synthesis of stable materials that can release or adsorb coins continuously in the presence of complex species usually present in drinking water that deposit and cause scaling in Nanomaterial surfaces. The ability to prepare nanostructured compositions at near ambient temperature has wide relevance for adsorption-based water purification.

The eighth lecture in the series was delivered on 16 October 2015 by Dr. S.K. Apte, Emeritus Professor, HBNI-DAE and Raja Ramanna Fellow, Bhabha Atomic Research Centre, Mumbai. Dr. Apte spoke on “Genetic engineering of *Denococcus radiodurans* for uranium bioremediation from radioactive, acid/alkaline aqueous waste”. He and his team have successfully designed an ecofriendly technology that is a promising



solution for bioremediation of toxic uranium from aqueous waste in high radiation environments.

In the ninth lecture on 19 October 2015, Dr. K.S. Rao, Senior Director, Safety Assessment, Syngene International Ltd., Bangalore in his lecture “Use of kinetic data in determining safety margins for first in human dosing”, mentioned that in the realm of new drug discovery one relies heavily on animal studies as surrogates to humans. Selection of the starting dose in humans is a complex process. The starting dose should be sufficiently low to be safe and high enough to avoid excessive dose escalations. He listed the various approaches that are currently in vogue for selecting the first in human dose.

The tenth lecture in the series was delivered by Dr. S. Nadadur, Programme Director, National Institute of Environmental Health Sciences, USA on 20 October 2015. In the lecture “Environmental health research in the 21st century: need for a paradigm shift in exposure and response analysis”, Dr. Nadadur said that research findings across the globe have clearly established that the environment plays a significant role in our health and disease contributing significantly to global disease burden. The current approaches in environmental health are evolving to understand the totality of exposure from pre-conception throughout life span. Besides exposure, the health research investigations should also integrate associated biological response alterations, homeostasis mechanisms and biological resilience.

The eleventh lecture in the series was delivered by Dr. S.C. Pandey, Department of Psychiatry, University of Illinois at Chicago, USA on 16 November 2015. Dr. Pandey spoke on “The emerging field of neuroepigenetics in the pathophysiology

of alcoholism”. He said that a variety of factors, including genetic traits, may mediate the development of alcoholism. As a long-standing hypothesis in the field of alcohol research, the dark side of addiction proposes that alcoholics may be predisposed to alcohol drinking behaviours as a compensatory mechanism to self medicate underlying heightened innate anxiety levels or anxiety that develops during withdrawal after chronic drinking. Epigenetic mechanisms via histone modifications and DNA methylation play an important role in the regulation of gene expression and synaptic plasticity.

The last lecture was delivered by Prof. Marco Foiani, IFOM & University of Milan, Italy at IITR on 27 November 2015. Prof. Foiani spoke on “An integrated network controlling cell plasticity, cell migration and genome integrity”. Human genome is continuously damaged by environmental and endogenous agents. The toxic effects of these factors result in DNA damage that may have long-term consequences such as cancer. Prof. Foiani said that his research interest has always been to study how cells in the human body control the chromosome



integrity and therefore prevent genome instability, which is a problem in cancer cells. Threat to DNA integrity has causative effects in tumor formation and development as well as relapse of cancer followed by treatment with chemotherapeutic agents. Mutations in DNA damage repair proteins result in their dysfunction and are often mutated in various cancer types; in fact, DDR represents an anti-cancer barrier in response to oncogenic stimuli. He showed the mechanisms and

regulatory pathways that are involved when cells are exposed to genotoxic agents. He also showed how DNA replication is coupled with DNA repair and recombination. A major problem in the cancer research field is to understand how DNA damage response pathways counteract aberrant transitions at replicating chromosomes by controlling the clash between replication and transcription and by preventing recombination events.

Visits

Mr Manohar Parrikar, Union Defence Minister Visits CSIR-NAL



Shri Manohar Parrikar visited the Trisonic Wind Tunnel Facility of CSIR-NAL. Shri Shyam Chetty briefed the Minister about the national facility and highlighted that every Indian aerospace vehicle has graduated out of this wind tunnel. The Hon'ble Minister was very happy to know that the wind tunnel facility has been performing reliably for over 50 years!

Shri Manohar Parrikar, Hon'ble Defence Minister of India visited CSIR-NAL on 6 September 2015. Mr Shyam Chetty, Director CSIR-NAL, received the Minister and apprised him about CSIR-NAL's technologies, facilities and capabilities. Mr Shyam Chetty also made a brief presentation on NAL's R&D contributions to the development of the national defence sector.

CSIR-NAL showcased its technologies at the Golden Jubilee Hangar which included LCA composite parts, Autoclave, Radomes, Avionics Products, Wankel Engine, DHVANI, MAVs, SARAS, Hansa etc. Shri Manohar Parrikar showed keen interest in the exhibits. He was very appreciative about NAL's DHVANI developed for the Indian Army.

Flower Show

Chrysanthemum and Coleus Show at CSIR-NBRI, Lucknow

A two-day Chrysanthemum & Coleus–2015 show was organized during 12-13 December 2015, at the Central Lawn of CSIR-National Botanical Research Institute, Lucknow to promote the floriculture industry. The show also provides an opportunity to the public to enjoy and enlighten themselves about Chrysanthemum and Coleus.

A total of 74 exhibitors participated in the show and exhibited 590 entries in various categories for the show. CSIR-NBRI is maintaining more than 225 germplasm collections of chrysanthemum comprising almost all colours and types. The various R&D activities on Chrysanthemum and Coleus undertaken by CSIR-NBRI were displayed and also explained. New varieties developed through different traditional and modern methods were displayed. It was also explained how chrysanthemum flowers can be commercially exploited by programmed blooming.

The public also got a unique opportunity to interact with scientists of NBRI and got first-hand information about agro-technology, techno-economics, commercial cut-flower varieties and many other cultivation practices.

The prize distribution function was organized at the open-air theater of the Institute, on 13 December 2015. Shri Amit Mohan Prasad, IAS, Principal Secretary (Agriculture), Govt. of UP was the Chief Guest and Dr. Mukesh Gautam, Director, Rajya Krishi Prabandh Sansthan, U.P. was the Guest of Honour. Mrs. Manju Nautiyal, Principal, CMS, Lucknow, also graced the occasion. A total of 369 prizes (111 First, 114 Second and 144 Commendation) in addition to 21 running challenge cups/shields/trophies were awarded to the successful competitors.

On this occasion, a new variety of Chrysanthemum ‘NBRI-Peetabh’ was released by Dr. C.S. Nautiyal, Director of the Institute. The uniqueness of the variety is that its flower head is unusually large in semi-cup shape having unique semi-quilled ray florets with extra long basal tube. It has attractive structural set-up and colour combination with purple stripes at the centre and light purple margins of the ray florets. The variety is suitable as a decorative pot plant for ornamental use.



A close-up view of “NBRI-Peetabh”



Prize winning entries of Chrysanthemum during the Flower Show



Dr. C.S. Nautiyal, Director, CSIR-NBRI and the prize winners at the Chrysanthemum and Coleus show



Dr. C.S. Nautiyal, Director CSIR-NBRI releasing the Chrysanthemum variety “NBRI-Peetabh”, along with (L-R) Shri Tilku Prasad, Dr. R.K. Roy and Dr. Arvind Jain

Honours & Awards

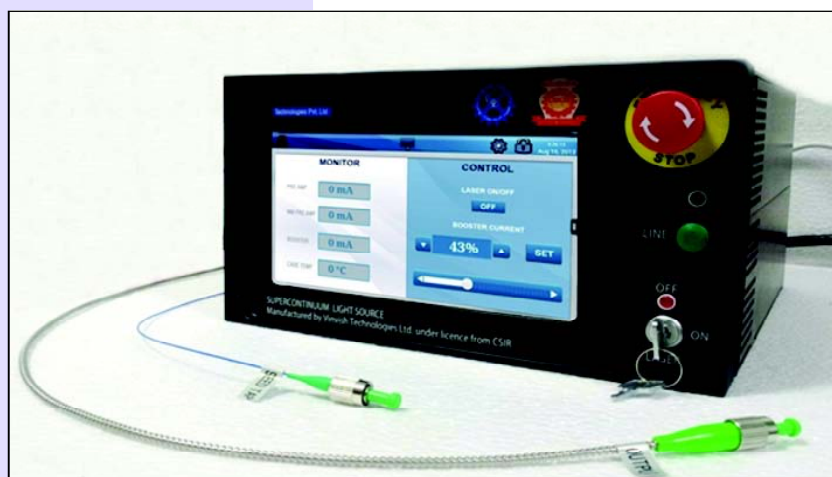
CSIR-CGCRI shares CSIR Technology Award-2015

CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata's entry "Completely packaged all-fiber supercontinuum light source" has won the CSIR Technology Award-2015 under the category "Innovation," jointly with CSIR-CLRI, Chennai.

The Super continuum broadband light source was developed at the Fiber Optics and Photonics Division at CSIR-CGCRI, under the CSIR-NMITLI project in collaboration with Vinvish Technologies, Trivandrum. Coupling an ultrafast laser pulse of single wavelength directly out of an oscillator into a few meters of highly nonlinear photonic crystal fiber (NPCF) produces more than an octave broad supercontinuum light. This NPCF was developed at CSIR-CGCRI. The system design, development of pump laser source, electronics control hardware, firmware packaged in an appropriate mechanical enclosure, the optical integration and testing, and validation of the product were carried out by Vinvish Technologies. The product was commercially launched in September, 2013 on the occasion of CSIR foundation day celebration at Delhi.

The system consists of an excitation pulsed pump laser, laser drivers, power stabilization circuits, photonics crystal fiber, collimating optics and power supply. The supercontinuum light source is packaged inside a module with dimension of 210 x 160 x 120 mm. This light source is powered by +24 VDC power supply. This module is operated by a front Tablet (Kindle) computer as standalone system and simple to operate. The maximum average optical output power of such broadband light source $\geq 2W$.

Unlike the normal wide band sources like tungsten, xenon, halogen and SLED, with limited power and spectral width, the developed source's wavelength span ranges from 400 nm to over 2450 nm, with orders of magnitude higher spectral power density of 0.1mW/nm to 1mW/nm. By varying the design parameters, the NPCF can be fabricated to have zero dispersion at a given wavelength, thus enabling soliton formation and dispersive wave generation in a specific length of PCF resulting symphony of nonlinear processes to generate supercontinuum light. Widest spectra are obtained when the pump pulses are launched close to the zero- dispersion of the NPCF. This broadband supercontinuum light source is useful for medical imaging, confocal fluorescence microscopy, material characterization, and various spectroscopic applications. The first product was sold to IIT-Kanpur in August 2014.



Packaged Supercontinuum
Broadband Light Source

Appointments

Dr. P. Goswami takes over as Director of CSIR-NISTADS



Dr. P. Goswami has taken over as Director, CSIR-NISTADS on 23 November 2015.

Dr. Goswami's early education had been in Assam, with M.Sc. in Physics from Gauhati University. He then joined the Indian Institute of Science for PhD in 1982; his doctoral work had been in the area of mathematical and theoretical physics. After PhD he had taken up research in atmospheric and climate modelling.

After post-doctoral studies at the Centre for Atmospheric and Oceanic Sciences, IISc, and a Visiting Professorship in the Department of Physics, IIT-Kanpur, Dr Goswami joined the CSIR-Centre for Mathematical Modelling and Computer Simulation (C-MMACS) in 1993 with primary focus of research on developing forecasting capabilities combined with basic understanding of the atmospheric and climate processes. Dr. Goswami had been heading the Climate and Environmental Modelling Programme at CSIR C-MMACS, now repositioned CSIR- Fourth Paradigm Institute.

Dr. Goswami received the Shanti Swarup Bhatnagar Prize in earth and planetary sciences in 2001 for his fundamental contributions. He was an Invited Prof. (2001-2003) at ENS, France at LMD. He also acted as a Lead Author of the Intergovernmental Panel on Climate Change (IPCC) Assessment Report 5, Working Group I.

Dr. Goswami pioneered long-range, high-resolution dynamical forecasting of monsoon in India through model reconfiguration and novel methodology, with experimental long-range forecasts

to establish proof of concept. He also initiated pioneering outreach activity in collaboration with Karnataka State Natural Disaster Monitoring Centre, Govt. of Karnataka, to provide forecasts at hobli level (village cluster), with novel methodology for skill and user acceptance.

Climate and weather informatics have tremendous but unused potential for many sectors; however, a major gap is interface models between weather and other processes. Dr. Goswami has developed applications of weather informatics, with novel algorithms for predicting weather-related diseases like malaria, ARD, dengue; crop diseases and renewable energy, with multi-sector synergy.

Dr. Goswami's research is highly multi-disciplinary, with high-impact research publications in several areas; he has currently 76 high-impact SCI publications. He has also guided eight PhD students so far from different universities. He is a professor at the Academy of Scientific and Innovative Research, where he served as Dean, Mathematical and Information Science.

Dr. Goswami has been Chairman/member of many institutional and research committees in India. He also maintains active collaboration with several national and international agencies/groups.



Shanti Swarup Bhatnagar Prize for Science and Technology – 2016

The Council of Scientific and Industrial Research (CSIR) invites nominations for the Shanti Swarup Bhatnagar (SSB) Prizes in Science and Technology for the year 2016. The SSB Prizes are to be given for research contributions made primarily in India during the past five years. The age of the nominee for the 2016 SSB Prize **should not be more than 45 years as on 31.12.2015**.

The SSB Prizes are awarded for notable and outstanding research, applied or fundamental, in the following disciplines: (1) Biological Sciences, (2) Chemical Sciences, (3) Earth, Atmosphere, Ocean and Planetary Sciences, (4) Engineering Sciences, (5) Mathematical Sciences, (6) Medical Sciences, and (7) Physical Sciences. The SSB Prize carries with it a citation, a cash award of Rs.5,00,000/- (Rupees five lakh only) and a plaque for each scientist selected for the award.

Nominations addressed to **Scientist Incharge - SSB YSA Unit, Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012** should be sent as per the prescribed pro-forma (Original + 2 copies) along with reprints of significant publications of the last 5 year's period on or before **31 March 2016**.

Soft copy (in PDF format) of duly filled proforma and significant publications of the nominee is also required in a CD/DVD/USB flash drive. The details of the SSB Prize and the prescribed pro-forma for nomination may be obtained from the above address or may also be downloaded from the website: www.csirhrdg.res.in

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