



# CeNS News

Issue 3 August 2018



A partial view of the Laboratory Block at the Shivanapura Campus

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## Director's Note

Centre for Nano and Soft Matter Sciences (CeNS) with its new mandate has entered into the fifth year. The in-house inventions are steadily progressing towards realising flexible, ergonomic futuristic technology. Nanotechnology being the focus, the diversity in research borne out of interdisciplinary is but natural; Nano connects and percolates seamlessly into the diverse areas of science and technology. CeNS exercises an open-minded approach to R&D in Nanotechnology with high emphasis on IP generation and technology realisation. The Centre has embarked on collaborative activity with well-known industries. It is growing in strength to new heights serving the society at large.

Outreach programmes of the Centre launched three years ago, विज्ञानि - विद्यार्थि विचार विनिमय (V4) for the popularization of science among school children, and Research Outreach Initiative (ROI), an internship programme for the benefit of students in their post-graduate degree in science or in engineering, are being

continued with enhanced vigour. A new programme, TechBuddy, meant to provide momentum to translational activities has been launched. Increasingly a large number of students are being enrolled for research programmes leading to PhD, in the area of nanoscience and technology. During the year 2017-18, lab facilities such as glove box for solar cell fabrication have been commissioned. A state of the art Transmission Electron Microscope is also being installed. Several new interactive products are added to the Centre's Prototype Gallery. These are attracting a large number of academic and industry visitors to the campus. Many extramural and industrial projects were undertaken during the year. The sensor lab is being upgraded to include facilities to carry out the 'Nanonose' project of the Centre. Various workshops held jointly with neighbouring institutions and national and international organisations have enhanced research interactions and networking. The Centre hosted the prestigious biennial event, International Conference on Nanoscience and Technology, under the

## News

**CeNS Sports Day** was held on 1 April 2017 on its new campus at Shivanapura. The event was open to CeNS members and their family.



CeNS researchers at the running event

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under the aegis of DST Nano Mission, Gol during March 21-23, 2018.

The Centre is expanding its activities at the new campus located at Shivanapura. The construction of a Laboratory block with basic facilities for fostering technology and development activities is ready for occupation.

## News

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**The International Yoga Day** was celebrated at CeNS on 21 June 2018. Ms. Sneha, Yoga Trainer, from Isha Yoga Foundation conducted the Upa Yoga demonstrations.



International Yoga Day at CeNS

Annual **Fresher's Day** was held on 11 August 2017 to welcome the new students.

**Independence Day** was celebrated at the Centre on 15 August 2017 with the National Flag hoisting by the Director. This was followed by a Pledge - Sankalp to Siddhi - to commemorate the 75th Anniversary of the Quit India Movement and to build a New India by 2022.



Faculty and students pledging "Sankalp to Siddhi"

**Swachhta Hi Seva** campaign was held at the Centre during Sep 15 - Oct 02, 2017. In this connection a talk on "Urban Solid Waste Management and Emerging Challenges" was delivered by Prof. H. N. Chanakya, Center for Sustainable Technologies, IISc, Bengaluru, on 27 September 2017

The Centre observed the **Vigilance Awareness Week** during Oct 30 - Nov 4, 2017. The faculty and administrative staff took a pledge on vigilance. Ms. M. Maragathavalli, Senior Audit Officer, Core Faculty - IS & Knowledge Centre, Regional Training Centre, Bengaluru,

spoke about vigilance awareness on this occasion.

**Kannada Rajyotsava** was celebrated at the Centre on 24 November 2017. Several programmes including Kannada songs rendition, essay competition, music, skit and quiz were held during the event.

A **Book Exhibition** was held at CeNS campus during 3-4 May 2018. The event was coordinated with the help of M/s. Tata Book House, IISc Campus, Bengaluru. A large number of scientific books related to Physics, Chemistry, Soft Matter and Nano Science and Technology were displayed.

**Swachhta Pakhwada-2018** was observed from 1 to 15 May 2018. During this fortnight, a campus cleaning drive was taken up to dispose off redundant/unwanted items as per the Govt. norms. Dr. Manjunatha M, Research Scientist, EMPRI, Bengaluru was invited on this occasion to deliver a lecture on "Plastic Waste Management".



Cleaning drive at CeNS as a part of "Swachhta Pakhwada-2018"

## New Inventions @ Prototype Gallery

New prototypes listed below were added to the Prototype Gallery during the last year.

- Luminescence based Lead Sensor
- Instant Hot Packs
- Transparent EMI shield
- Detecting the Unseen
- Breath RHgram

Needless to say, it attracted a large number of Industry visitors who showed keen interest in the prototypes.

## Academic & Research Activities

### 'TechBuddy' Programme

A new R&D Programme 'From in-house Inventions to Prototype Development' (FIPD) was launched in April 2018 to hire "TechBuddies" (candidates with engineering background) to assist in translating innovative lab findings to commercially viable products.

### Ph D admissions

During August and January sessions (2017-2018), 8 students joined the PhD programme.

### Ph D Degree was awarded to...

**P. Sridivya**, thesis titled "Experimental studies on anisotropic soft matter at atmospheric and elevated pressures", 25 April 2018

**Bramhaiah Kommula**, thesis titled "Synthesis and Properties of Graphene Based Hybrid Materials Employing Chemical Routes", 17 July 2018

### Publications

Publications: 65

Chapter in Books: 2

Average Impact Factor: 4.18

## Forthcoming Events

**9th MRS Trilateral Conference on Advances in Nanomaterials: Energy, Water & Healthcare at Bengaluru**, during October 22-24, 2018



## Outreach Activities

### विज्ञानि - विद्यार्थि विचार विनिमय (V4)

Under this programme, in the last one year alone, the Centre reached out to nearly 2700 students who participated in innovative science learning activities which included lab tours, scientific talks and experimental demonstrations on its campus. Apart from this CeNS faculty visited academic institutes/schools/colleges and conducted workshops/delivered lectures for the student community.



Mr. Sachin Bhat, research scholar, CeNS, explaining **wonders of chemistry** to young students from BEL High School on 30 June 2018



Dr. P.K. Santra, CeNS, addressing Ideal Java Rotary School, Mysore, on 21 July 2018

### Research Outreach Initiative Studentship (ROIS)

The Research Outreach Initiative Studentship (ROIS) programme, designed to provide research experience to highly motivated masters or engineering students saw twenty four students successfully completing various projects in research areas of Nano and Soft Matter Sciences during the year 2017-18.



## Industry Interaction

A **technology-knowhow-transfer agreement** was signed with Lab Engineers (India) on 22 May 2017 to manufacture and commercialize low cost mask-less projection lithography system.

The Centre participated in the **India International Science Festival (IISF)-2017** held during 13-16 October 2017 at Chennai. The academic, outreach and R&D activities of CeNS were highlighted at the festival. Centre's capability to transform laboratory research into the technological applications was demonstrated through prototypes.

An **R&D project (funded by DST Nanomission)** with **Hind High Vaccum Pvt. Ltd., Bengaluru**, to manufacture oxide coated metal mesh based transparent conducting plates has commenced.

Under an **IGSTC project** in collaboration with University of Bayreuth, Papierfabrik Louisenthal and Tata Steel Ltd., the fabrication of metal network on a PET foil by Role to Role process has been accomplished.

CeNS participated in the **9th Bengaluru INDIA NANO 2017** held during 7-9 December 2017 at Lalit Ashok, Bengaluru. Prototype devices, developed by CeNS researchers, showcased during the event received high recognition from the industry and academic visitors.



A sample piece of the transparent conductor cut from a roll of crack templated polymer film-based on the invention of Prof. G.U.Kulkarni & his group, at IGSTC project meeting held at Papierfabrik Louisenthal in Gmund am Tegernsee, Germany, April 2018.

### New projects

A project between CeNS and Centre for High Technology (CHT) titled "Scale-up studies and process development for hydrogen production by catalytic decomposition of natural gas" commenced during the year 2017.

A **Nano Mission project** titled "Transparent conducting glasses made of metal nanomesh coated with metal oxide overlayer and scaling their production to m<sup>2</sup> area" commenced from August 2017.

## New Facilities Created

A state of the art Transmission Electron Microscope (TEM) from ThermoFisher (Model Number: Talos F200 G2) is being installed in a vibration-isolated laboratory at the Shivanapura campus. The 200 kV microscope has a point-to-point resolution of 0.25 nm with a magnification up to 0.9 million times. It comes equipped with CMOS camera with 40 fps, ideal to monitor in-situ experiments. The system has in-column energy dispersive X-ray detector (EDS) which makes it suitable to identify elements/ compositions of nanomaterials. The future plan includes procurement of 3-D reconstruction/ tomography with suitable sample holder.

Facilities such as Spray Coating, Large Volume Liquid Mixing and Screen Printing units have been added to TSAMRC laboratory.



## Awards

**Sunil Walia**, SRF, won "Best Poster Award" at the IUSSTF Workshop, 11 & 13 March 2017.

**Marlin Baral**, SRF, won Best Poster award for "CNT-reinforced polymer stabilized LCD", CeNS-Manipal University Joint Workshop 2017, 27-28 June 2017

**Marlin Baral**, SRF, won Best oral presentation award for "Carbon nanotube reinforcement caused thermally invariant operating voltage and accelerated dynamics in a polymer stabilized liquid crystal device", CeNS-INST Joint Symposium 2017, 16-17 November 2017

**Brindhu Malani S**, SRF, won Poster award for "Colloidal monolayer lithography" at CeNS-INST Joint Symposium, Hospet, 16-17 November 2017.

**Sunil Walia** was conferred with the prestigious "Karnataka DST Nanoscience Fellowship" award instituted by the Dept of S & T, Govt of Karnataka, for his poster titled "Transparent Faraday Cage", at the 9th Bengaluru INDIA NANO 2017, 7-9, December 2017, Bengaluru.

**Vaishak. V. M.** won "Best Poster Award" for his poster titled "Enhanced photoluminescence in anisotropic magnetogel" at the 9th Bengaluru INDIA NANO 2017, 7-9, December 2017, Bengaluru.

**Brindhu Malani S**, SRF, won Best poster award for "Hydrophobic-hydrophilic patterned surfaces with selective wettability" at CompFlu 2017, IITM, 18-20 December 17.

**Pragnya Satapathy**, JRF, got Best poster award from Springer for "Direction dependent photoluminescence blocking in liquid crystals using ZnO-Ag nanohybrids", ICONSAT 2018, 21-23 March 2018

**Indrajit Mondal**, JRF, got Poster Award for "Large Area Smart Windows for Indoor Light and Heat Modulation", ICONSAT 2018, 21-23 March 2018

**Umesha Mogera**, PDF, got ACS Poster Award for "Decoupled Graphene Multilayers and its Extraordinary Properties", ICONSAT 2018, 21-23 March 2018



## Honours



**Bharat Ratna  
Professor C.N.R. Rao,  
F.R.S.**

Chairman of the Governing Council, received the highly prestigious Von Hippel Award for materials research. The citation reads "...for his immense interdisciplinary contributions to the development of novel functional materials, including nanomaterials, graphene, superconductivity, 2D materials and colossal magnetoresistance". The award was presented to Prof. Rao at the MRS meeting held in Boston on 29 November 2017.



**Prof. G. U. Kulkarni**

received Prof. C.N.R. Rao Science award at the 13th Kannada Science Conference held on 19 September 2017.



**Neena S. John**

received the Springer award for best paper at the, 'International Conference for NextGen Technologies: Silicon to Software' organized at VIT University, Chennai, in March 2017

# Workshops/Seminars/Conferences/Colloquia

• The 2nd CeNS – Manipal University Joint Workshop based on the theme “Advances in Nano and Soft Materials” was held at CeNS, Bengaluru on 27-28 June 2017.

• A Joint workshop between CeNS, DRDO and JNCASR on “Frontiers in Nanoscience and Technology” jointly organized by CeNS was held on 4 – 5 July 2017 at JNCASR, Bengaluru



CeNS, DRDO and JNCASR scientists participating in the joint workshop “Frontiers in Nanoscience and Technology”

• A Joint Symposium involving CeNS, and INST, Mohali, organized by CeNS, was held during 16-17 November 2017 at Hospet, Karnataka. Bharat Ratna Professor C N R Rao, Chairman, Governing Council, CeNS and Chairman, Board of Governors, INST, in his opening remarks, stressed the importance of doing quality scientific research and building active collaborations between the two institutes.



Participants “CeNS-INST Joint Symposium”, Hampi, Hospet, 16-17 Nov 2017

• IGSTC Workshop on “Solar photovoltaics: Materials, Mechanisms and Methods” was held on 25 September 2017 at CeNS.

• Nanomission School on “Nanoscience and Nanotechnology-Physical Sciences”, 2017, sponsored by DST Nanomission,

Govt. of India, was organized by CeNS at the Jalahalli campus, Bengaluru, from 23 October– 3 November 2017. The inaugural lecture was given by Bharat Ratna Prof. C N R Rao, FRS, on ‘Glimpses of the Nanoworld’. Around 40 Ph.D students, postdoctoral fellows and young faculty, from all over India participated in the School.

• A Conference on Physics and Chemistry of Materials was organised during 12-13 March 2018, at Thimphu, Bhutan. About twenty invited lectures with topics based on nanomaterials applications related to energy and environment were delivered.

• The Centre organized ICONSAT 2018 under the aegis of Nano Mission, Department of Science and Technology (DST), Government of India, during 21-23 March 2018 at National Science Seminar Complex, IISc, Bengaluru.



Bharat Ratna Prof. C. N. R. Rao, FRS, delivering inaugural speech at the ICONSAT-2018



Prof. Mark Hersam delivering plenary talk at the ICONSAT-2018

The conference was inaugurated by Bharat Ratna Prof. C.N.R.Rao, FRS, and attended by nearly 600 participants from the academia and industry. The Conference covered several



Cultural event at ICONSAT-2018: Dance ensemble ‘Sriyah’ being performed by “Nriyagram” artists

thematic topics in the field of nano science and technology, bringing out cutting edge developments in the domain of material as well as biological sciences.

• A special programme “Nano for Youth”, was conducted at the Satish Dhawan Auditorium, IISc, Bengaluru on 22 March 2018. The programme, supported by Nano Mission, DST, Government of India, was conceptualised by Bharat Ratna Prof. C. N. R. Rao, FRS, also the patron of Nano Mission. It provided the participants, mainly B.Sc/B.Tech/M.Sc students, a rare opportunity to interact with renowned scientists. Nearly 375 students and teaching faculty from 22 colleges participated in the programme.



A glimpse of “Nano for Youth” program held on 22 March 2018

• One-day Workshop on Nano Technology & its role in Defence & Other Applications, jointly with Society of Defence Technologists (SODET), C/o Bharat Electronics Limited (BEL), Bengaluru was organized on 6 July 2018 at the BEL campus.

## Colloquia /Seminars: Visitors

### Speaker of the Month

- *Our efforts towards manufacturing of metal and metal oxide nanomaterials by continuous flow methods and the story of "self-expandable non-vascular stents"*, Dr. B. L. V. Prasad, CSIR-NCL, Pune, 22 August 2017
- *Liquid Crystal in optoelectronic and biosensor applications*, Dr. Santanu Kumar Pal, IISER, Mohali, 23 June 2017
- *Towards Non-Equilibrium Supramolecular Materials*, Dr. Subi Jacob George, JNCASR, Bengaluru, 10 November 2017
- *Quantum Crystallography: A charge density route to understand molecular interactions*, Prof. T. N. Guru Row, IISc, Bengaluru, 15 December 2017
- *3D printing of metals: challenges and opportunities for materials science and engineering*, Prof. Upadrasta Ramamurty, IISc, Bengaluru, 12 January 2018

### Seminars

- *Coupling of Elementary Excitations: Drawing Parallels Between Excitons and Plasmons*, Prof. K. George Thomas, IISER - Thiruvananthapuram, 11 July 2017
- *Dipolar addition and its utility in the synthesis of bio active compounds*, Prof. Balakrishna Kalluraya, Mangalore University, Manglore, 21 July 2017
- *Semiconductor Nanocrystals: To Dope or not to Dope*, Prof. Narayan Pradhan, Indian Association for the Cultivation of Science, Kolkata, 14 August 2017
- *Fast switching LCD modes*, Prof. Lachezar Komitov, CEO Tridentic Holding, Professor of Physics, University of Gothenburg, Sweden, 21 September 2017
- *Modelling Thermal Transport and Machine learning for Nanomaterials*, Dr. Ankita Katre, LITEN, CEA-Grenoble, France, 12 October 2017
- *Affordable Nano-diagnostics for food, water, and health security*, Priyanka Sabherwal, IISER, Mohali, 13 October 2017
- *Metal-Sulfur Rechargeable Batteries*, Prof. Aninda J. Bhattacharyya, IISc, Bengaluru, 24 October 2017
- *Low Thermal Conductive Materials for High Performance Thermoelectrics* Dr. Kanishka Biswas, JNCASR, Bengaluru, 24 October 2017
- *KPFM and CAFM Characterization of 2D layer Based Interfaces*, Prof. B. R. Mehta, IIT, Delhi, 24 October 2017
- *Electronic Structure of 2D Materials*, Prof. Umesh V. Waghmare, JNCASR, Bengaluru, 24 October 2017
- *Solution Processed Field Effect Transistors* Prof. K. S. Narayan, JNCASR, Bengaluru, 25 October 2017
- *Photoelectron Spectroscopy for Nanomaterials using Synchrotron Techniques*, Prof. D. D. Sarma, IISc, Bengaluru, 25 October 2017
- *Growth Property Correlations in 2D materials*, Prof. S. Raghavan, IISc, Bengaluru, 26 October 2017
- *Scanning Tunneling Spectroscopy and Differential Conductance Images of Compound Semiconductors in their Lower-Dimensional Forms*, Prof. Amlan J. Pal, IACS, Kolkata, 26 October 2017
- *Semiconductor Nanostructures*, Prof. S. M. Shivaprasad, JNCASR, Bengaluru, 27 October 2017
- *Magnetic Materials and Devices*, Prof. P. S. Anil Kumar, IISc, Bengaluru, 30 October 2017
- *Coupling of Elementary Electronic Excitations: Drawing Parallels Between Excitons and Plasmons*, Prof. K. George Thomas, IISER, Thiruvananthapuram, 30 October 2017
- *Nanoindentation*, Prof. U. Ramamurty, IISc, Bengaluru, 31 October 2017
- *Raman Spectroscopy of Nanomaterials*, Prof. Chandrabhas Narayana, JNCASR, Bengaluru, 31 October 2017
- *Aberration Corrected HRTEM: Basics and Application in Materials Science*, Prof. Ranjan Datta, JNCASR, Bengaluru, 01 November 2017
- *X-ray Scattering Techniques to Study the Structure of Nanomaterials*, Prof. Mrinmay K. Mukhopadhyay, SINP, Kolkata, 02 November 2017
- *Electron Microscopy of Materials*, Prof. N. Ravishankar, IISc, Bengaluru, 03 November 2017
- *Quantum Crystallography: A charge density route to understand molecular interactions*, Prof. T. N. Guru Row, Solid State and Structural Chemistry Unit, IISc., Bengaluru, 15 December 2017
- *Photophysical, Sensing, and Bioimaging Study in Polymeric Nanoparticle System*, Dr. Soumitra Satapathi, Department of Physics, IIT Roorkee, 19 December 2017
- *Novel Lab based X-ray Spectroscopy Techniques for non destructive Trace Level Chemical Mapping (2D & 3D), Ultra Thin Film Thickness Monitoring and Electronic State Characterization at Micron Resolution*, S H Lau, Vice President of Business Development, Sigray Inc., 19 January 2018
- *Frequency-based detection of magnetic particles at the nano-scale*, Manu Sushruth, University of Western Australia, under the supervision of Dr. Peter Metaxas and Prof. Mikhail Kostylev, 24 January 2018
- *New trends in crystalline Si based solar cells*, Dr. Aldrin Antony, National Centre for Photovoltaics Research and Education (NCPRE), IIT Bombay, 14 February 2018
- *Investigation of the Structure and Thermal behaviour of Polymer Liquid Crystal / Single wall Carbon Nanotubes Nanocomposite* Dr. Ginka Kaltcheva Exner, Associate Professor, Plovdiv University, Bulgaria, 02 March 2018
- *Flexoelectric and Electric impedance Spectroscopy studies of Nanostructured Nematic Liquid Crystals*, Dr. Yordan G. Marinov, Associate Professor, Georgi Nadjakov Institute of Solid State Physics, Bulgarian Academy of Sciences, Bulgaria, 02 March 2018
- *Inorganic nanotubes and fullerene-like nanoparticles at the crossroad between materials science and nanotechnology and their applications*, Prof. R. Tenne, Department of Materials and Interfaces, Weizmann Institute, Israel, 12 March 2018
- *Modelling High Frequency Electromagnetics Using COMSOL Multiphysics*, Manisha Chetry, COSMOL, 16 July 2018
- *Optical Simulation with CST*, Mr. Pankaj Jha, Application Engineer, CST India, 10 July 2018
- *COMSOL Multiphysics*, Mr. Uttam Pal, Application Engineer, COMSOL

• *Intellectual Property Services with emphasis on Patent Filing*, Mr. Prayank Khandelwal and Mr. Raghavendra Bhat, Legasis Services, Bengaluru, 17 July 2018

## Seminars: Students Thematic

• *Soft electronics for healthcare applications*, Priya Madhuri, 17 July 2017

• *Recent advances in environmental gas sensors*, Sunil Walia, 20 November 2017

### Journal Article based Seminar

• *A Flexible Integrated System Containing a Micro supercapacitor, a Photodetector, and a Wireless Charging Coil*, Suman Kundu, 11 May 2017

• *H-bonded donor-acceptor units: towards high mobility ambipolar organic semiconductors*, Madhu Babu Kanakala, 12 May 2017

• *Flexible and Highly Sensitive Pressure Sensors Based on Bionic Hierarchical Structures*, Indrajit Mondal, 23 May 2017

• *A Molecular nematic liquid crystalline material for high performance organic photovoltaics*, Marlin Baral, 25 May 2017

• *Helical Nano-crystallite (HNC) Phases: A new type of Dark Conglomerates*, Rekha S. Hegde, 29 May 2017

• *Photo Driven Soft Robotics*, Vaisakh V. M., 16 June 2017

• *Ultimate Stable Underwater Superhydrophobic State*, Brindhu Malani S., 13 November 2017

• *Single step ambient air synthesis of graphene from renewable precursors as electrochemical genosensor*, Rajashekhar N. Pujar, 22 December 2017

• *Self-Organized Frameworks on Textiles (SOFT): Conductive Fabrics for Gas Sensing and Filtration*, Sachin A. Bhat, 09 February 2018

• *3D printing PDMS Elastomer in a Hydrophilic Support Bath via freeform Reversible Embedding*, Pragnya Satapathy, 25 May 2018

• *Making waves in a photoactive polymer film*, Varshini G. V., 31 May 2018

• *MXene molecular sieving membranes for highly efficient gas separation*, Ramya Prabhu B., 08 June 2018

• *An Artificial Flexible Visual Memory System Based on an UV-Motivated Memristor*, Gaurav Shukla, 26 June 2018

• *New insights into the electro-chemical hydrogen oxidation and evolution reaction mechanism*, Alex C., 28 June 2018

• *Porous organic/inorganic hybrid one dimensional photonic crystals for rapid visual detection of organic solvents*, Madhu Babu Kanakala, 03 July 2018

• *Fractal design concepts for stretchable electronics*, Prashanth Nayak, 05 July 2018

• *A multi-state memory device based on the unidirectional spin Hall magnetoresistance*, Subir Roy, 10 July 2018

• *Photochemically and Thermally driven color reflection in a halogen-bonded chiral molecular switch*, Rekha S. Hegde, 13 July 2018

• *Humidity-Tolerant Single-Stranded DNA-Functionalized Graphene Probe for Medical Applications of Exhaled Breath Analysis*, Suman Kundu, 20 July 2018

• *High-Performance Hazy Silver Nanowire Transparent Electrodes through Diameter Tailoring for Semitransparent Photovoltaics*, Indrajit Mondal, 27 July 2018

### Thesis Colloquia

• *Synthesis and Characterization of Liquid Crystalline Compounds*, Veerabhadraswamy B. N., 03 July 2017

• *Thin Films of Ferroelectric Polymers, Blends and Composites at Interfaces*, Chandan Kumar, 25 January 2018

• *Studies on the Surface Properties of Langmuir-Blodgett Films of some Biological and Mesogenic Molecules*, Arup Sarkar, 03 May 2018

• *A study on structure-property relationships of some thermotropic liquid crystalline materials*, Monika M., 29 June 2018

## Intellectual Property and Patents

1. A strain sensor and method thereof	G. U. Kulkarni, K. D. M. Rao & R. K. Srivastava	PCT Application No.PCT/IB2017/052183
2. Textured Glass as hybrid Transparent Conducting Electrode	Shyam Kumar Choudhary, Sumitesh Das, G. U. Kulkarni, Rajashekhar N. Pujar	Indian Patent Application No.: IN201721043702
3. Compounds exhibiting chiral nematic phase	C V Yelamaggad, Govindaswamy Shanker	Indian Patent Application No.: IN201741034439
4. Semiconductor junction for photo-generated electrons and method thereof	G. U. Kulkarni, Bharath B, KDM Rao, Harish KN	Indian Patent Application No.: IN201741022128
5. A method of enhancement of photoluminescence in a chiral nematic liquid crystal	S Krishna Prasad, Marlin Baral, Himali Patel, A S Achal Kumar, C V Yelamaggad	Indian Patent Application No.: IN201741020498
6. A Nematic Liquid Crystal composite with enhanced photoluminescence and method thereof	Geetha G. Nair, V M Vaisakh, A S Achal Kumar, Balaram Pradhan, C V Yelamaggad	Indian Patent Application No.: IN201741029031
7. Chiral Plasmonic Liquid crystalline gold nanoparticles and method thereof	C V Yelamaggad, D. S. Shankar Rao, S. Krishna Prasad, Geetha G. Nair, Sachin A Bhat	Indian Patent Application No.: IN201841001456
8. A method of exfoliation of layered materials and product thereof	H.S.S.R.Matte, Kenneth Lobo, Shivam Trivedi	Indian Patent Application No.: IN201841014328
9. A micro supercapacitor and method thereof	G.U.Kulkarni, Suman Kundu, Umesha Mogera	Indian Patent Application No.: IN201841008669

## Special Lectures

The 14th Professor S. Chandrasekhar Memorial Lecture was delivered on 6 September 2017 by Prof. Ajay K. Sood, FRS, Honorary Professor, Department of Physics, IISc, Bengaluru. The talk titled "Active Matter: Flocking and Bacterial Heat Engine" was attended by, among other invited guests, members of the Governing Council and the Research Advisory Board, the family of Prof. Chandrasekhar, faculty and research scholars.

A special edition of the V4 programme was held on 7 November 2017 to observe **Dr. C.V. Raman's birthday**. The students and teaching staff from the Little Flower School, Banashankari, Bengaluru, participated in the event. The programme included a lecture titled "Small Questions and Big Answers" by Prof. S.M. Shivaprasad, Director, Karnataka State Higher Education Academy, Dharwad and Professor, JNCASR, Bengaluru. The students were also taken on a guided tour of the LITE Gallery.

CeNS celebrated **National Science Day** on 28 February 2018 by inviting students from BEL High School, Bengaluru. The theme was "Science and Technology for a Sustainable Future". Two talks titled "Imagine life without science" and "Spintronics" were delivered by Prof. Ashok K. Ganguli, Department of Chemistry, Indian Institute of Technology, New Delhi and Prof. P.S. Anil Kumar, Indian Institute of Science, Bengaluru, respectively.



Prof. Anil Kumar interacting with young students from BEL High School

## Highlights

A report on "**Smart Hydrogel Windows**" developed by Prof. Kulkarni and his group appeared in the 11 November 2017 edition of The Hindu. The report said..."Scientists at Bengaluru have developed a smart window that automatically turns from transparent to opaque when heated and also gets back to its original transparent state when the heat is removed. ... windows are very cheap costing less than Rs.100 per sq foot. These can be installed to create less energy-consuming buildings..."

CeNS was bestowed with "**Best Exhibit Award for the Year 2017**" in the category of Innovative Display at the 9th Bengaluru INDIA NANO 2017, 7-9, December 2017, Bengaluru.



... in pursuit of  
Global excellence in Science and  
to nurture  
Indigenous Technology for the  
betterment of Our Country.

## Visiting Faculty

**Dr. Shridhar M.P.**

Assistant Professor,  
Department of Physics,

Siddaganga Institute of Technology, Tumkur

## New Appointments

### Research Associates

Astakala Anil Kumar (Provisional)

Navas M.P.

Rajasekhar Yerrasani

Rajesh Katoch

Ram Sevak Singh

Ritesh Raj D.

Sreejesh M.

Vaishali Sharma M.

### R&D Assistants

Sharadhi N. Raj

B. Lavanya (Safety Management)

Bikesh Gupta (Project)

Kanaka Deepthi Voora

Kaushik Baishya

Keerthan Acharya

Math Shivalingayya

Melzita Joyline D'Souza

Mukhesh K G (Project)

Navyashree V.

S. Vimala (Project)

Shekh Saddam Husen

Srividya Adiga (Project)

### TechBuddy

Rahul M.

### Others

Venkatesh K.

Sanjit K. Parida

R. Sundaram

Noormuthu H.

Bhavin Naik B.S.

### Project Scientists

Uma S Hiremath

Ashutosh K. Singh