



वसुधैव कुटुम्बकम्  
ONE EARTH • ONE FAMILY • ONE FUTURE

...in pursuit of

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

*Brochure*  
2021-2022



नैनो एवं मृदु पदार्थ विज्ञान केंद्र

विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार के अधीन एक स्वायत्त संस्था

**CENTRE FOR NANO AND  
SOFT MATTER SCIENCES**

Autonomous Institute under the Dept. of Science and Technology, Govt. of India



# Brochure

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## About CeNS

The Centre for Nano and Soft Matter Sciences (CeNS) is an autonomous research institute under the Department of Science and Technology (DST), Government of India. DST provides core support to the Centre in the form of a grant-in-aid for conducting basic and applied research in nano and soft matter sciences.

The Centre was established in 1991 by an eminent liquid crystal scientist, Prof. S. Chandrasekhar, FRS. It was then known as Centre for Liquid Crystal Research, a registered scientific society in Karnataka with the objective to build a Centre of excellence in line with the international trend those days on liquid crystal materials and devices. In 1995, it became an autonomous institute under the Department of Electronics (DOE), Government of India and in 2003, was brought under DST. Subsequently in the year 2010, the name was changed to Centre for Soft Matter Research. Recently in 2014, the Centre has further widened the scope of research activities to embrace nanoscience and technology and is now known as Centre for Nano and Soft Matter Sciences (CeNS). It is being mentored by Nano-Mission of the Government of India.

CeNS is located at 'Arkavathi' at Shivanapura, Bengaluru North, which hosts ample greenery and has a lovely serene space that would inspire new ideas and probably lead to path-breaking scientific achievements.

The Centre is engaged in materials research at all relevant length scales. Specifically, the current activities are focused on a variety of metal and semiconductor nanostructures, liquid crystals, gels, membranes and hybrid materials. It has close interactions with many Institutions and Industry, in India and abroad.

# Governing Council

## CHAIRMAN

### **Professor Krishna N. Ganesh**

Director  
Indian Institute of Science Education and Research (IISER) Tirupati  
Karakambadi Road, Mangalam, Tirupati, Andhra Pradesh, 517 507

## MEMBERS

### **Dr. Srivari Chandrasekhar**

Member Ex officio  
Secretary to the Government of India  
Department of Science and Technology  
Technology Bhavan,  
New Mehrauli Road, New Delhi – 110 016

### **Shri Vishvajit Sahay**

Member Ex officio  
Additional Secretary & Financial Advisor  
Department of Science and Technology  
Technology Bhavan, New Mehrauli Road,  
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### **Shri Raja Sekhar M. V.**

Director (R&D)  
Bharat Electronics Limited  
Outer Ring Road, Nagawara,  
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### **Professor Pallab Banerji**

Professor and Former Head  
Materials Science Centre  
Indian Institute of Technology  
Kharagpur- 721 302, West Bengal

### **Professor Shreepad Karmalkar**

Department of Electrical Engineering  
Indian Institute of Technology Madras,  
Chennai-600 036, Tamil Nadu

### **Professor Ashok K. Ganguli**

Deputy Director (Strategy & Planning)  
Professor, Department of Chemistry  
Professor, Department of Materials Science & Engineering,  
Institute Chair Professor,  
Indian Institute of Technology Delhi,  
New Delhi - 110 016

### **Professor Umesh V. Waghmare**

Professor, Theoretical Sciences Unit  
Jawaharlal Nehru Centre for Advanced Scientific Research  
Jakkur P.O., Jakkur, Bangalore 560 064

## MEMBER SECRETARY

### **Professor Bhagavatula L. V. Prasad**

Director  
Centre for Nano and Soft Matter Sciences  
Arkavathi, Survey No. 7, Shivanapura, Dasanapura Hobli, Bengaluru North - 562 162

# Research Advisory Board

## **Professor D. D. Sarma**

Chairman  
Solid-State and Structural Chemistry Unit  
Indian Institute of Science  
Bengaluru - 560 012

## **Dr. Ashish Lele**

Member  
Director  
CSIR-National Chemical Laboratory,  
Dr. Homi Bhabha Road, Pune - 411 008

## **Professor Chandrabhas Narayana**

Member  
Director  
Rajiv Gandhi Centre for Biotechnology  
Thiruvananthapuram, Kerala – 695 014

## **Professor P. B. Sunil Kumar**

Member  
Director  
Indian Institute of Technology, Palakkad  
Ahalia Integrated Campus, Kozhippara P. O.  
Palakkad, Kerala 678 557

## **Dr. Sumitesh Das**

Member  
Director  
Tata Steel UK R&D, Tata Steel Limited  
Room No.154, Research and Development Division  
Jamshedpur – 831 007

## **Dr. Tata Narasinga Rao**

Member  
Director (Additional Charge)  
International Advanced Research Centre for Powder  
Metallurgy & New Materials (ARCI), Balapur P.O.  
Hyderabad-500 005

## **Professor Bhagavatula L. V. Prasad**

Convener  
Director, CeNS  
Arkavathi, Survey No.7, Shivanapura,  
Dasanapura Hobli, Bengaluru - 562 162

# Faculty

## Director

B. L. V. Prasad

## Adjunct Professor

Giridhar U. Kulkarni

## Faculty

### Scientist F

Geetha G. Nair  
D. S. Shankar Rao  
Veena Prasad  
C. V. Yelamaggad

### Scientist E

S. Angappane  
P. Viswanath  
Neena S. John

### Scientist D

Pralay K. Santra  
H. S. S. Ramakrishna Matte

### Scientist C

Ashutosh Kumar Singh  
Kavita A. Pandey

### Honorary Professor

S.Krishna Prasad





## Research Activities

At nanoscale, matter behaves differently, depending critically on the size and shape. Soft on the other hand, stands for interactions at relatively longer length scale and the combination, Nano and Soft, essentially signifies the overall control on wide ranging material properties, be it electronic, optical, magnetic, thermal, mechanical or rheological. Thus, the research activities in the Centre are focussed on realizing nano and soft materials through novel synthetic methods, manipulation and control of material properties and translating them to potential products by up-scaling and prototyping. The researchers at the Centre work in close collaboration to realize a comprehensive picture of the materials in addition to broadening the scope of the scientific activities. The collaboration extends to other scientific groups, in India and abroad, resulting in dissemination of knowledge and publication of important papers.

Research Areas	Capabilities	Applications
Nanomaterials and composites	Large/small scale synthesis, Characterization, Assembly, Device fabrication	Energy, Sensing, Catalysis, Electronics, Biomedical, Energy harvesting/storage, Electrochemical diagnostics
Soft materials and composites	Small scale synthesis, Characterization, Device Fabrication	Display, Sensing, Smart windows
Surfaces and Interfaces	Assembly, Device fabrication, Smart coating	Environment, Sensing, Smart glass

## Research Grants

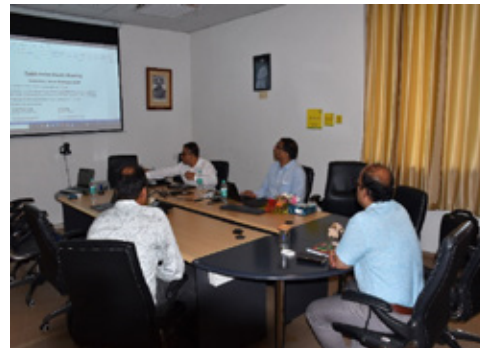
CeNS obtained research grants from the following: - Annual core grant from DST; Extramural funding from Science and Engineering Research Board (SERB), DST; Funding from Tata Steel Advanced Materials Research Centre (TSAMRC), Saint-Gobain India Pvt Ltd, ITC Ltd, Module Innovations Pvt Ltd and Maithri Aquatech Pvt. Ltd.

## Industry Interaction

CeNS has a joint project with ITC Limited for developing photocatalytic nanoparticles. CeNS has signed an MoU with Maithri Aquatech Pvt. Ltd to work on a joint project for the design and development of atmospheric water generator. A joint project with Saint-Gobain Research India is ongoing for the design and development of smart windows. NDA has been signed with various companies such as AGI glaspac, Progency etc to explore product development in areas of coatings and mask fabrication.

### Technology Transfer

- Design of 'Triboelectric Facemask' licensed to Camellia Clothing Pvt. Ltd., in May 2020. The masks produced by the company are available at various e-commerce platforms including at the company's online platform, [www.3bo.in](http://www.3bo.in). Inventors: Pralay K. Santra, Ashutosh K Singh and G. U. Kulkarni.
- The 'Translucent - Transparent switching microfluidic glass' technology transferred to Saint-Gobain Research India in Feb 2021. Inventors: Ashutosh K Singh, G. U. Kulkarni and Rahul M.



CeNS- Asian Paints Meeting



CeNS- Saint Gobain Meeting

# Prototype Gallery

The Prototype Gallery, Greenhouse, hosts more than fifteen prototype devices, listed below, developed by CeNS researchers based on the lab-level findings. The gallery provides a platform to have a focused dialogue with potential industry partners.

The displayed prototypes are Disinfecting wipes and Hand Sanitizer, Invisible EMI shield, Face shield, Fog on-demand, Metal oxide–Ag based antimicrobial coatings, Triboelectric Generator Based on Bio-compatible Polymer, Polymer dispersed liquid crystal based smart window, Breath RH gram, Tribo electric Mask, Instant hot packs, Luminescence based lead-sensor, Self-heated cover slips, Detecting the unseen, Defogging panel, Protective coating for copper, Defrosting panel, Graphene coated glass, Graphene coated glass and fast responding anisotropic organogel. Recently more prototypes were added to the gallery and includes - Antimicrobial facemasks, Affordable smart window using ITO free transparent electrodes, Face shield with social distancing alarm warning system.



Triboelectric Face Mask



Affordable Smart Window

# Greenhouse

Green house is a Technology Incubator project uniquely emulating a not-for-profit entity for potential nanotechnology business incubation funded by Nano Mission, Department of Science and Technology, Government of India.

## Mission statement

To nurture nascent ideas & concepts, incubate lab-level science, and translation to commercial products of high social relevance and impact.

- Soft platform to CeNS faculty to take up entrepreneurship for translational activities.
- Individual or joint ventures with external agencies including industry.
- Assistance in overcoming barriers in incubating precious ideas.
- Channeling usage of CeNS research facilities at attractive charges.
- Multi-dimensional business-related assistance including orientation and training, IPR related issues, statutory/governmental approvals, industry expertise and consultancy, marketing and marketing survey.
- Hosting and promoting workshops, business meetings, entrepreneurship development programmes and so on.



Prof K. N. Ganesh, Chairman, Governing Council, CeNS visiting the Prototype Gallery at Greenhouse. Prof. B.L.V. Prasad, Director, CeNS is also seen.



## B L V Prasad

B L V Prasad obtained his MSc (Chemistry) and Ph.D. (Chemistry) from University of Hyderabad, India (1997). His research interests include synthesis and shape and size control of nanomaterials, Molecular and nanoparticle assembly, Bio-conjugates of nanoparticles and their applications and Nanoparticle-Organic Molecule Functional Hybrids. His professional experience includes Research Associate (1999-2000) and JSPS fellow (1997-1999) at Tokyo Institute of Technology (with T. Enoki), Tokyo, Japan (1997-2000), Research Associate, Kansas State University, USA (2000-2003), Scientist, National Chemical Laboratory, Pune (2003 – 2021). He has taken charge as Director, CeNS from July 2021.

### Ph.D Students

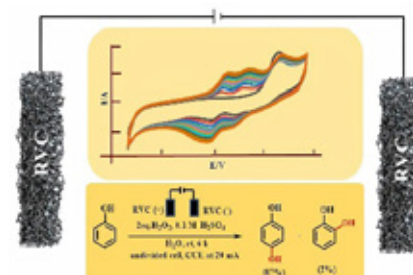
Dev Sankar Choudhuri  
Muskan  
Mouli Das

## RESEARCH HIGHLIGHTS

### Selective electro-oxidation of phenol to 1,4-hydroquinone employing carbonaceous electrodes: surface modification is the key

The oxidation of phenol leading to 1,4-hydroquinone with high conversion, remarkable selectivity and an excellent yield (87% isolated) has been accomplished under electrolytic conditions in an aqueous medium employing modified carbon-based electrodes.

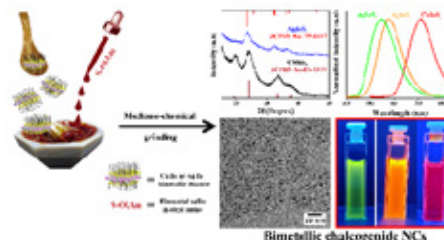
Reference: New J. Chem.,46, 2518-2525, (2022).



### Lamellar Bimetallic Thiolates: Synthesis, Characterization and their Utilization for the Preparation of Bimetallic Chalcogenide Nanocrystals through Mechano-Chemical Grinding

Bimetallic thiolates like copper-indium thiolate and silver-indium thiolate are shown to exist as lamellar sheets with each sheet containing both metal ions arranged in a random fashion. These bimetallic thiolates could be employed as single source precursors to prepare phase pure bimetallic chalcogenide nanocrystals (NCs) through mechano-chemical routes by grinding them with an appropriate chalcogenide source.

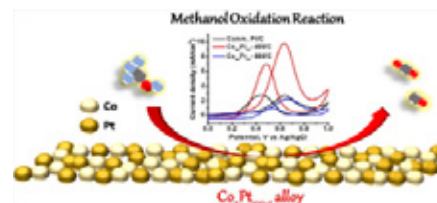
Reference: Adv. Mater. Interfaces, 8, 2100898, (2021).



### Disordered but Efficient: Understanding the Role of Structure and Composition of Co-Pt Alloy on the Electrocatalytic Methanol Oxidation Reaction

Systematic investigation of the electrocatalytic Methanol Oxidation Reaction (MOR) by CoPt alloys reveal that structures with disordered atomic arrangements with Co:Pt atomic ratios near to 1:1 display better electrocatalytic efficiencies even when compared to pure Pt..

See: J. Phys. Chem. C, 125, 14, 7611-7624, (2021).





## G. U. Kulkarni Adjunct Professor

President  
Jawaharlal Nehru Centre for Advanced  
Scientific Research (JNCASR)

G U Kulkarni obtained his Ph.D. in Solid State and Structural Chemistry, Indian Institute of Science (1992) and Postdoctoral research at Indian Institute of Science (1992 – 1993). He was a Postdoctoral research fellow under UNILEVER project at Cardiff University, UK (1993-95) and also Visiting Scientist at Cardiff University, Tokyo University, TASC-INFM, Trieste; Scuola Normale Superiore, Pisa; Purdue University, Institut de Sciences Moléculaires d'Orsay, Université Paris Sud.

Ph.D Student  
Suchithra P.

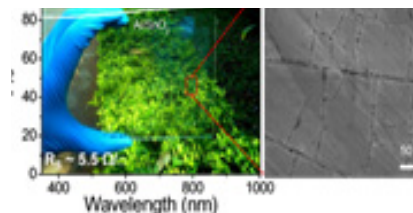
<https://www.jncasr.ac.in/faculty/kulkarni>

## RESEARCH HIGHLIGHTS

### SnO<sub>2</sub> on Invisible Aluminum Mesh: A Cost-Effective Replacement for ITO and FTO

When it comes to working with high-temperature stable transparent conducting electrodes (TCEs), the only choice is the expensive fluorine-doped SnO<sub>2</sub> (FTO). 'SnO<sub>2</sub> coated invisible Al mesh' termed as 'hybrid mesh' can be a cost-effective solution to replace the expensive FTO and ITO in those applications. For the fabrication of the hybrid mesh, an industrial-scale process wherein SnO<sub>2</sub> film is formed on Al micro-mesh by spray coating a precursor solution has been developed. Additionally, a surface-fluorination on the SnO<sub>2</sub> film improves both the environmental and electrochemical stabilities, which are extremely favorable for solar cells, LEDs and smart windows fabrication.

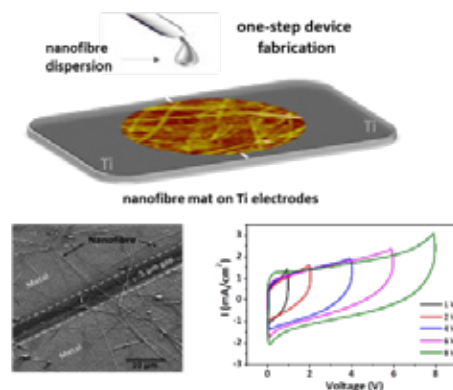
References: ACS Appl. Mater. Interfaces, 12, 54203-54211, (2020)



### Self-assembly based molecular devices

Planar micro-supercapacitors are emerging as necessary devices for rapid energy sourcing in on-chip circuitry. A severe drawback in micro-supercapacitor is the energy density value, which is limited by the working potential of the electrolyte used in it (typically below 3V).

A fabrication recipe for a planar supercapacitor is developed with an operating voltage of 8V, highest among the reported till date. The electrolyte used here is in the form of 1D supramolecular nanofibres, consisting of coronene tetracarboxylate and dodecyl methyl viologen, carrying K<sup>+</sup> and Br<sup>-</sup> ions, respectively. The nanofibres are drop-spread across the Ti micro-gap electrodes, wherein the ambient formed TiO<sub>2</sub> surface provides the electrochemical stability. It has been shown that dielectrophoresis assisted assembly of the nanofibres along the micro-gap could boost the capacitance value to 388 mF/cm<sup>2</sup>.



Another aspect studied in connection with the supramolecular fibres is the response to humidity. The fibres are poorly conducting under dry conditions but gain high conductivity when exposed in humid air. This aspect has been exploited in fabricating a sensitive humidity sensor with unprecedented fast response and recovery times. The sensor is demonstrated to work as a breath sensor for monitoring the respiration rate as well as hydration levels in individuals.

References: J. Mater. Chem. A, 8, 13106-13113 (2020)  
Nano Energy, 61, 259-266, 2019  
Nano Energy, 61C, 259 (2019)



## Geetha G Nair

Geetha Nair obtained her Ph.D. (1993) in Physics from Raman Research Institute (RRI), Bengaluru. She was a Post-Doctoral Fellow at RRI and a visiting scientist at Kent State University, USA.

Her Research areas of interest are liquid crystal gels and composites, nano-soft composites, soft anisotropic metamaterials, soft photonic systems, hybrid gels.

### Ph.D Students

Amit Bhardwaj  
Nurjahan Khatun

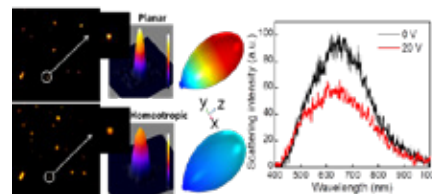
### Research Associate

Vimala S

## RESEARCH HIGHLIGHTS

### Enhanced Mie resonance in a low refractive index colloidal metamaterial

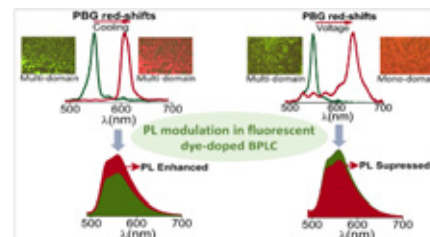
Typically, dielectric metamaterials are fabricated using high refractive index materials as they facilitate efficient light confinement due to strong Mie resonances. Inducing such resonances in low index materials is highly desirable for bio-compatible nanophotonic applications. Enhanced Mie resonances are achieved in a nematic liquid crystal (NLC) colloidal metamaterial composed particles due to anisotropic nature of the medium, leading to forward scattering. The experimental findings are supported by FEM simulations with the formation of photonic nanojet.



See: J. Mol. Liq, 346, 117116 (1-10), (2022).

### Effect of Photonic Band Gap on Photoluminescence in a Dye-Doped Blue Phase Liquid Crystal

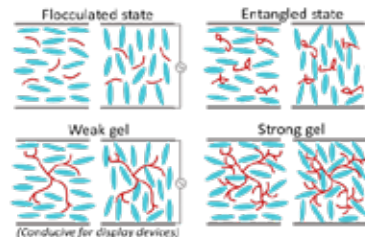
A contrasting behaviour in the modulation of photoluminescence (PL) intensity in a fluorescent dye-doped blue phase liquid crystal (BPLC, a 3D soft photonic crystal) is demonstrated despite both thermal and electric fields have similar effect (red-shift) on the photonic bandgap.



See J. Phys. Chem.B, 125, 11582-11590, (2021).

### Interplay between bulk and molecular viscosity of a soft glassy nematic gel

Calorimetric and rheological measurements in a NLC gel composed of a NLC host and an organogelator distinguish between 4 different regimes, viz., flocculated fluid, entangled solid, weak gel, and strong gel, depending on gelator concentration. In weak gel, the rotational viscosity and response time reduce by an order of magnitude compared to pristine NLC, making it a preferred composite for display devices.



See: Liq. Cryst., 49:7-9, 1235-1245 (2022)

<https://www.cens.res.in/en/faculty/geetha/profile>



## D S Shankar Rao

D.S Shankar Rao obtained Ph.D. (1994) in Physics from Raman Research Institute, Bengaluru. He worked as a post-doctoral fellow at Samsung Advanced Institute of Technology, Seoul, South Korea before joining CeNS in 1995.

### Ph.D Students

G V Varshini  
Rajalaxmi Sahoo  
P.R. Gayathri

### R & D Assistant

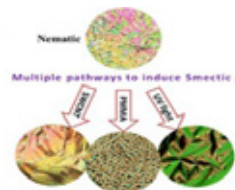
Jaisas Jeni Chandran

## RESEARCH HIGHLIGHTS

### Multiple pathways to induce/ stabilize an ordered phase

Smectic induction, the resultant reentrant phase sequence by adding CNT, a non-aromatic polymer (PMMA) and photoisomerization to the host nematic liquid crystal

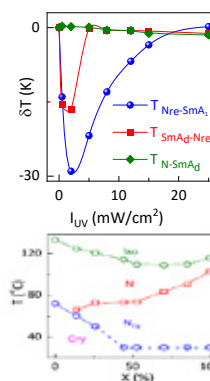
- Anomalous photoinduced shift in a material with multiple re-entrant phases, viz., N-SmA<sub>d</sub>-RN-SmA.
- The strongest influence on the RN-SmA<sub>1</sub> transition, least on the N-SmA<sub>d</sub> with SmA<sub>d</sub>-RN having the intermediate effect.
- The diminution in the RN-SmA<sub>1</sub> and SmA<sub>d</sub>-RN transition temperatures with IUUV is non-monotonic.



Reference: Liquid Crystals, 49:7-9, 952-968 (2022)

### Dielectric and viscoelastic investigation in a binary system of soft and rigid bent mesogen exhibiting the NTB phase

- Softness of the central portion of the molecules plays a major role on thermal, dielectric and viscoelastic characters.
- Dielectric spectroscopy measurements bring out modes, attributed to the fluctuations of clusters and rotation of individual molecules around their short axes
- Permittivity data in the isotropic phase show strong antiparallel correlation for an intermediate concentration.
- Twin valued rotational viscosity for intermediate concentration.

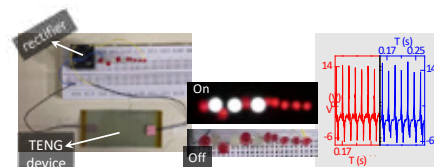


See: Journal of Molecular Liquids 323, 114987-1-11 (2021)

### Energy harvesting by employing Transparent TENG device with TPU Films

- Simple, cost-effective, bio-compatible, transparent robust TENG device with Thermoplastic polyurathene material having nanoscale roughness.
- Potential candidate for applications in optoelectronics, self-powered devices, and other biomedical applications

See: J. Nanosci. Nanotechnol. 21, 3072-3080 (2021)



3D AFM Images of DB and ES films

<https://www.cens.res.in/en/faculty/shankarrao/profile>





## Veena Prasad

Veena Prasad obtained her Ph.D. (1994) in chemistry from Raman Research Institute, Bengaluru. She joined CeNS in 1995 as a research associate and later she was a post-doctoral fellow at Korea University, Seoul, South Korea. Since 1997, she is a faculty at CeNS. She was a visiting scientist at Kent state University, USA

## RESEARCH HIGHLIGHTS

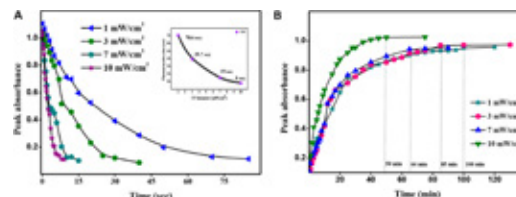
### Evaluation of Photo Switching Properties for Hockey Stick-Shaped Mesogens Bearing Azo Benzene Moieties

The photoresponsive behavior of hockey stick-shaped mesogens bearing azo wing with different terminal alkoxy chains at one end are investigated. Except for the compound E16 which exhibits a SmC phase along with a nematic phase, all the other compounds are found exhibit only a nematic mesophase. The influence of varying alkoxy chain lengths on the photo-physical properties of these are investigated using UV-Vis spectroscopy.

It is observed that the influence of chain length is almost negligible on the thermal back relaxation time.

Spectroscopic investigation with variable intensities of UV light studies reveals that reverse cis-trans isomerization process was inversely proportional to the intensity of illuminated light. A spectroscopic study of the solid sample using guest-host mixture was also carried out and the compilation of results forecast these mesogens as ideal candidates for optical storage devices.

Reference: *Frontiers in Physics*, 9, 728632 (1-9) (2021).

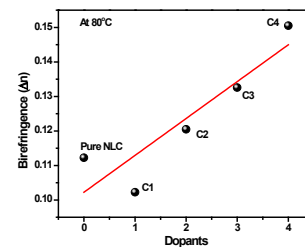


(A) Photosaturation time versus UV intensity plot for E–Z isomerization and (B) Thermal back relaxation or Z–E isomerization of compound E12 with different intensities.

### Porous carbon nanoparticles Dispersed nematic liquid crystal: Influence of the particle size on electro-optical and dielectric parameters

Porous carbon nanoparticles (PCNPs) of four different sizes (~180 nm, ~51 nm, ~41 and ~25 nm) were dispersed into a nematic liquid crystal (NLC) in 0.25 wt% concentration. PCNPs were derived from biowaste materials and pyrolyzed at elevated temperatures to get the porous structure. Polarising optical microscopic observations were carried out in dark and bright states on both the pure NLC as well as NLC-PCNPs composites. Homogeneous alignment was well maintained in all the composites except the one with the highest sized (~180 nm) PCNPs. Birefringence, relative permittivity and dielectric anisotropy, increases as the size of the PCNPs is decreased in the composites. The threshold voltage was also found to decrease with the decrease in the size of the PCNPs. Such investigations may be useful for the fabrication of display devices such as flat panel displays (FPDs) and phase shifters.

See: *Liquid Crystals*, 49:7-9, 1223-1234, (2022)



Change in birefringence with respect to different sized dopants at 80 °C.



## C V Yelamaggad

C V Yelamaggad obtained his Ph.D. (1991) in Organic Chemistry from Karnataka University, Dharwad. He was a Postdoctoral Fellow at NCTU, Taiwan and Dept. of Org. Chem., IISc, Bangalore. His experience includes being Senior R & D Scientist, Bulk Drug Industry, Bangalore and Visiting Scientist at LCI, Kent State University, USA. He was an RSC Visiting Fellow, at York University, York, UK and JSPS Fellow at NIMS, Tsukuba, Japan

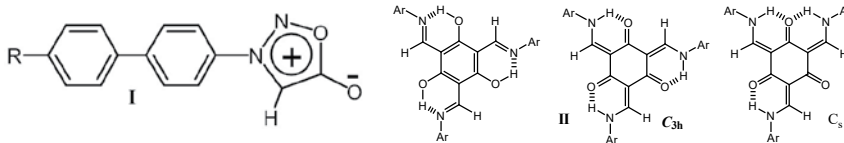
**Ph.D Student**  
Abhishek Kumar

**Research Associate**  
Santosh Y Khatavi

## RESEARCH HIGHLIGHTS

### Functional conventional liquid crystals (LCs)

Novel molecular engineering concepts to stabilize technologically important liquid crystal (LC) phase/s have been objectives. For example, saydnones (I) & tris-salicylideneanilines (II) that have the ability to serve as media for various devices have been our targets.

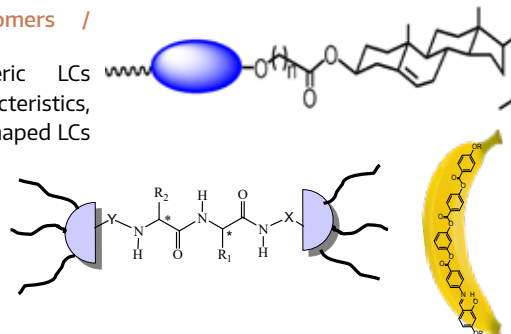


Publications: (a) J. Am. Chem. Soc. 2004, 126, 650; (b) Chem. Commun. 2005, 1552; (c) ACS Appl. Mater. Interfaces, 2017, 9, 39569; (d) J. Org. Chem. 2013, 78, 527; (e) ACS Omega, 2021, 6, 3291

### Non-conventional LCs: Oligomers / Polycatenars

Wide varieties of oligomeric LCs with multifunctional characteristics, metallomesogens, and banana-shaped LCs have been our research topics.

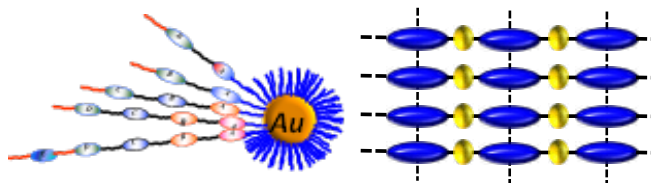
We have been disclosing that the usage of naturally occurring chiral synthons in mesogens helps in realizing unprecedented mesomorphism



Publications: (a) Adv. Mater. 2017, 29, 1700676; (b) Angew. Chem. Int. Ed., 2004, 43, 3429; (c) J. Mol. Liq. 2021, 325, 115059; (d) Org. Lett. 2007, 9, 2641; (e) Chem. Mater, 2007, 19, 2463

### Soft-Nanocomposites and Coordination polymers (COPs)

Soft-nanocomposites and COPs have been designed and realized. Their significance in applied sciences has been disclosed. COPs detect explosives and toxic metal ions



Publications: (a) Mater. Horiz., 2021, 8, 525; (b) Nanoscale Adv., 2021, 3, 2508; (c) Nanoscale Adv., 2021, 3, 2269; (d) ACS Appl. Energy Mater., 2019, 2, 8098; (e) RSC Adv. 2020, 10, 13532

<http://www.cens.res.in/faculty/yelamaggad/profile>



## S Angappane

Angappane obtained his Ph.D. (2004) from Indian Institute of Technology (IIT) Madras. He did his post-doctoral work at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru and Sungkyunkwan University, Korea.

### Ph.D Students

Athira M.  
Swathi S P  
Vishnu G. Nath  
Fathima Shafna K K  
Anusha Dsouza

## RESEARCH HIGHLIGHTS

### Structural colors using TiO<sub>2</sub> nanostructures

Structural colours were generated by TiO<sub>2</sub> nanorods on glass and flexible PTE substrates employing a glancing angle deposition (GLAD) technique. A permanent wettability of the structural colors is achieved. Further, a stable high temperature anatase phase TiO<sub>2</sub> nanorods was prepared.

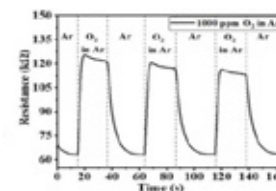
See: Appl. Opt. 59, 10483 (2020); Appl. Surf. Sci. 577, 151874 (2022)



### Gas sensors using titanium dioxide nanostructures

A room temperature oxygen sensor was developed using e-beam evaporated slanted nanorods of pure TiO<sub>2</sub> and Cr doped TiO<sub>2</sub>, which shows excellent sensing properties with UV illumination.

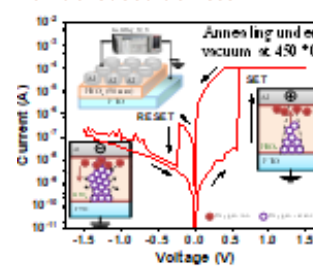
See: Mater. Res. Bull. 140, 111324, (2021).



### Enhanced resistive switching performance of hafnium oxide-based devices

The growth temperature and annealing conditions have been varied to significantly improve the characteristics of hafnium oxide-based resistive switching devices. The insights into the influence of annealing temperatures on the switching parameters pave a way for the design of low-power devices for data storage applications.

See: J. Alloys Compd. 913, 165251 (2022).



<https://www.cens.res.in/en/faculty/angappane/profile>



## P Vishwanath

P Vishwanath obtained his Ph.D. (2004) in Physical Sciences from Raman Research Institute, Bengaluru. He did his post-doctoral work at Laboratoire Interdisciplinaire sur l'Organisation Nanométrique et Supramoléculaire, Saclay, France and at the Max Planck Institute for Colloids and Interfaces, Golm, Germany.

### Ph.D Students

Prashanth Nayak  
Pinchu Xavier  
A Anand Eswara Rao  
M V Manikanta Tatayya Naidu

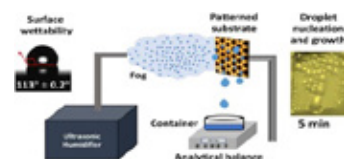
### R&D Assistant

Benexy Correya

## RESEARCH HIGHLIGHTS

### Enhanced fog harvesting using biomimetic, patterned and chemically modified surface.

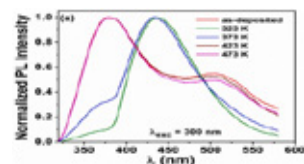
Inspired by the *Stenocara* beetle, hexagonally ordered surfaces consisting of silicon and gold regions were fabricated using colloidal lithography and were also selectively modified using self-assembled monolayer. We find such biomimetic hybrid surfaces promotes fog harvesting and improves the yield of water.



Reference: Langmuir 37(38), 11203 (2021).

### Impact of thermal annealing on photoluminescence in thin Langmuir-Blodgett films of crystalline polymorphs of metallo-phthalocyanine

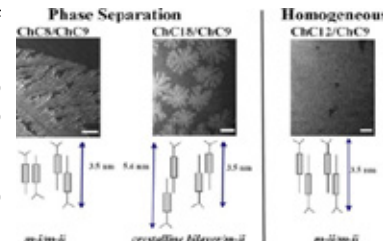
The structural, morphological and photoluminescence aspects in thermally annealed Langmuir-Blodgett films of copper and zinc octakis octyloxy phthalocyanine and their mixture is explored. Signatures unique to thin film polymorphs were identified.



Reference: Optical Materials 125, 112069 (2022).

### Miscibility studies of some homologues of cholesteryl n-alkanoates at interfaces

The miscibility of some homologues of cholesteryl n-alkanoates at different interfaces is studied. While  $\text{ChC}_8/\text{ChC}_9$  and  $\text{ChC}_{18}/\text{ChC}_9$  mixtures exhibit phase separation,  $\text{ChC}_{12}/\text{ChC}_9$  mixtures form a stable, homogeneous phase. We attribute this behavior to the difference in molecular packing which may be of relevance to tear film formation and stability.



Reference: Langmuir 37(38), 11203 (2021)

<https://www.cens.res.in/en/faculty/viswanath/profile>



## Neena S John

Neena S John obtained her Ph.D. (2007) in Materials Chemistry from Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru. She worked as a post-doctoral fellow at the University of Manchester, U.K. and Indian Institute of Science, Bengaluru before joining CeNS in 2010. Her main research interests are electrocatalytic hydrogen generation and energy conversion, synthesis of inorganic nanomaterials, surface enhanced Raman spectroscopy based molecular detection, scanning probe microscopy.

### Ph.D Students

Alex C.  
Ramya Prabhu B.  
Muhammed Safeer N. K.  
Jil Rose P.  
Nikhil N. Rao  
Palash Jyoti Gogoi  
Manish Verma  
Amir Sohel

### R&D Assistant

M N Rajendra

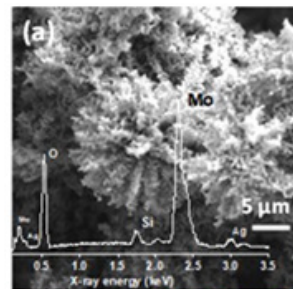
<http://www.cens.res.in/faculty/neena/profile>

## RESEARCH HIGHLIGHTS

### Inorganic Nanomaterials

Micro-nano structures of  $\text{MoO}_3$  with spiky morphology resembling sea-urchins can be grown on various substrates by a simple chemical bath deposition method. The spiky tips can be modified with silver nanoparticles for use as SERS substrates and they exhibit enhanced Raman spectra from dyes and mercaptobenzoic acid of the order  $10^9$  and detection limit in nM concentration. These materials possess the capability for the detection of toxic pollutants present in small quantities. Films of transition metal chalcogenides,  $\text{MoX}_n$ ; ( $X = \text{O}, \text{S}, \text{Se}$ ) are prepared by a hydrothermal assisted liquid/liquid interface method, where in the respective precursors are dissolved in water and toluene phase to achieve film formation at the planar interface.

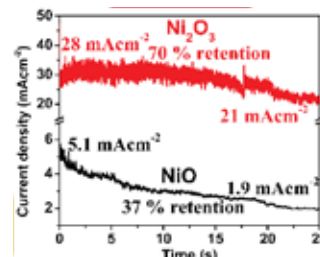
See: *Nanoscale Adv.*, 2019,1, 2426, *Appl. Surf. Sci.* 2020, 511, 145579.



### Electrocatalysts for Hydrogen Generation

Urea electro-oxidation (UOR) has the potential to replace oxygen evolution with less overall cell potential and thereby, can reduce the input energy for hydrogen generation. Nickel oxide catalysts facilitating the active site,  $\text{NiO}(\text{OH})$  formation with better poison tolerance provide high activity and stability. Development of catalysts with inherent active site stability, defect engineering etc are undertaken to improve UOR efficiency. Sustained hydrogen evolution from electrochemical water splitting is achieved with a Pd co-ordination polymer (COP) –reduced graphene oxide(rGO) composite catalyst. A partial reduction of the composite generates Pd nanoparticles that are stabilized by the polymeric ligands and rGO enhancing the stability to 70 hr at a higher current density of  $300 \text{ mA/cm}^2$ .

See: *Electrochim.Acta* 2021,385,138425, *J. Mater.Chem.A* 2022,10,4209, *ACS Appl. Energy Mater.* 2019, 2, 8098





## Pralay K Santra

Pralay K Santra obtained his M.S. (2006) and Ph.D. (2011) from Solid State and Structure Chemistry, Indian Institute of Science, Bangalore. He worked as postdoctoral research associates at University of Notre Dame, Stanford University, and Uppsala University before joining CeNS in November 2016. He is currently an Early Career Editorial Advisory Board Member of ChmNanoMat.

### Ph.D Students

Trupthi Devaiah  
Modasser Hossain  
Radha Rathod  
Aishwarya Mungale  
Abhishek Roy  
Ushita Roy

## RESEARCH HIGHLIGHTS

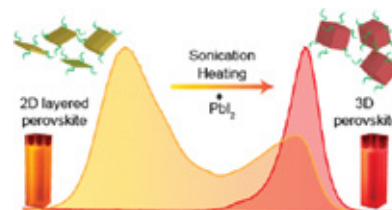
### Ion exchange in Perovskite and Ternary Chalcogenide Nanocrystals

Inorganic and organic perovskite and ternary nanocrystals have attracted attention in the recent past because of their exciting optoelectronic properties. These nanocrystals can undergo easy ion exchange, which gives rise to a tunable bandgap and different internal heterostructures that play a significant role in controlling their properties.

Using various techniques, including synchrotron methods, we study these nanocrystals to probe the anion exchange and their effect of the internal heterostructures

See: J. Phys. Chem. C, 125, 12131–12139, (2021)

See: Nanoscale, 12, 20840 (2020)



### Area selective atomic layer deposition

As the device dimension reaches nanometer feature sizes, conventional top-down semiconductor fabrication processes have become more challenging, leading to alignment issues. Area-selective atomic layer deposition (AS-ALD), as a promising bottom-up alternative, has the potential to address these challenges and provide a robust and controllable fabrication process. We are focusing on fundamental studies to obtain insight into the ALD growth on various surfaces, that can further improve area-selective ALD approaches.

<https://www.cens.res.in/en/faculty/pralay/profile>



## H S S Ramakrishna Matte

H S S Ramakrishna obtained his Postdoc from Humboldt University Berlin, Department of Physics, Berlin, Germany (June 2015 – Dec 2016) and from Northwestern University, Evanston, United States (March 2013 – March 2015). He obtained his Ph.D. and M.S. degrees in Chemical Sciences from Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India.

### Ph.D Students

Kenneth Lobo  
Ramesh Chandra Sahoo  
Priyabrata Sahoo  
Savithri Vishwanathan  
Rahul Singh  
Himani Saini  
Rohit Thakur  
Harshit Pandey

### Research Associates

Vijaya Kumar G  
Suresh Babu

### R&D Assistants

Deepak Kumar Tamudia  
Amit Kumar Gupta

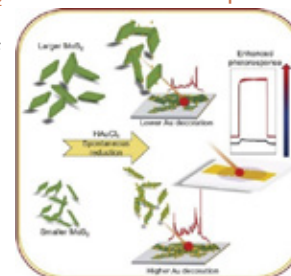
<https://www.cens.res.in/en/faculty/ramakrishna/profile>

## RESEARCH HIGHLIGHTS

### Spontaneous formation of gold nanoparticles on MoS<sub>2</sub> nanosheets and its impact on solution-processed optoelectronic devices.

In this work, the chemical nature of MoS<sub>2</sub> as a function of nanosheet size is investigated through the spontaneous reduction of chloroauric acid. Upon using the gold-decorated MoS<sub>2</sub> nanosheets as substrates for surface-enhanced Raman scattering exhibited an enhancement factor of  $1.55 \times 10^6$  for smaller nanosheets which is 7-fold higher as compared to larger nanosheets.

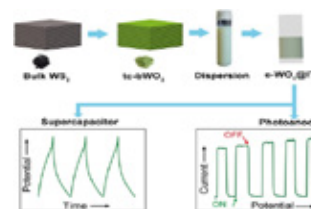
Reference: iScience, 25, Issue 4, 104120 (2022).



### Solution Processing of Topochemically Converted Layered WO<sub>3</sub> for Multifunctional Applications.

Herein, a one-step topochemical synthesis approach was used to obtain bulk layered WO<sub>3</sub> (t<sub>c</sub>-WO<sub>3</sub>) from commercially available layered WS<sub>2</sub> by optimizing synthesis conditions. Afterwards, LPE was carried out on t<sub>c</sub>-WO<sub>3</sub> in 22 different solvents; among the solvents studied, the IPA/water (1:1) co-solvent system appeared to be the best suggesting the possible matching of surface tension and HSP of bulk WO<sub>3</sub> to that of the co-solvent system. The thin films obtained using spray coating were used as active materials in supercapacitors as well as photoanodes for photoelectrochemical water oxidation.

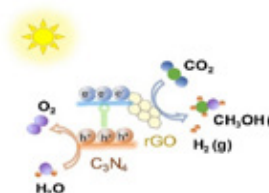
Reference: Chem.Eur. J.,27, 11326–1133, (2021).



### Bandgap engineered g-C<sub>3</sub>N<sub>4</sub> and its graphene composites for stable photoreduction of CO<sub>2</sub> to methanol.

In this work, a simple and cost-effective copolymerization strategy was developed to synthesize g-C<sub>3</sub>N<sub>4</sub> by selecting the appropriate precursors and optimizing the synthesis parameters, which resulted in lowering the bandgap from 2.80 eV to as narrow as 2.40 eV. To further improve the charge separation and conductivity, g-C<sub>3</sub>N<sub>4</sub> and reduced graphene oxide (rGO) based composites were synthesized. The obtained composite catalysts were studied for photocatalytic CO<sub>2</sub> reduction. It is important to note that g-C<sub>3</sub>N<sub>4</sub>/rGO composites resulted in the selective photoreduction of CO<sub>2</sub> to methanol as the only liquid product with evolution rates of  $\sim 114 \mu\text{mol g}^{-1} \text{h}^{-1}$  along with H<sub>2</sub> ( $68 \mu\text{mol g}^{-1} \text{h}^{-1}$ ) under scavenger free conditions and exhibited robust stability.

Reference: Carbon 192, 101-108, (2022)





## Ashutosh K Singh

Ashutosh K Singh obtained his Ph.D. (Physics) in 2016 from S.N. Bose National Center for Basic Sciences, Kolkata, India. His research interest lies in synthesis & design of nanomaterials for energy applications and developing low-cost recipes for transparent electrodes and their smart applications. Most importantly, his group strives to translate our laboratory research findings into technology.

### Ph.D Students

Athira Chandran M  
Rahul M  
Rahuldeb Roy  
Pritha Dutta  
Mukhesh K G  
Ganesha Mahendra

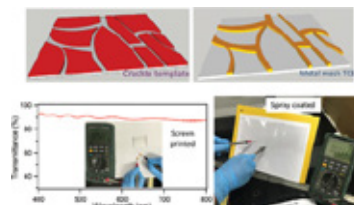
### R&D Assistant

Hafis Hakkeem

## RESEARCH HIGHLIGHTS

### Large-Area, Flexible, Transparent Conducting Electrodes Using Screen Printing and Spray Coating Techniques

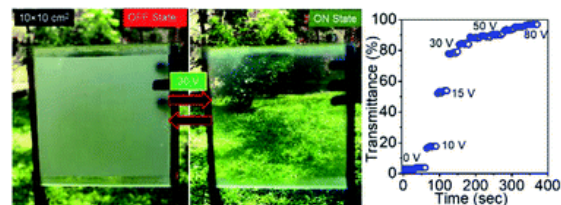
Fabrication of large-area transparent conducting electrodes (TCEs) of high performance through cost-effective high throughput methods has been an area of intensive research. In this context, the fabrication of flexible, 25 cm<sup>2</sup> wide TCEs with high figure of merit (FoM) ( $\sim 494 \Omega^{-1}$ ) is achieved by two roll-to-roll compatible processes, namely screen printing and spray coating, by suitably modifying crackle lithography in a cost-effective manner. The fabricated TCEs exhibit low sheet resistance ( $< 10 \Omega/\text{sq}$ ) and high transmittance ( $\sim 86\text{--}90\%$ ) in the visible region. The TCEs are shown to be highly bendable, the change in the sheet resistance is only  $\sim 2\%$  up on 6000 bending cycles. The application of these TCEs as transparent bendable uniform Joule heaters and surface capacitive touchscreens has also been demonstrated. The TCEs are, thus, just as good as any TCE produced using spin-coating or similar small area coating techniques.



Reference: Advanced Materials Technologies 2101120 (2021).

### SnO<sub>2</sub>@Al-mesh hybrid electrodes as an alternative of ITO plates for Smart window applications

CeNS scientists has come-up with an in-expensive recipe of making transparent conducting electrodes which has properties similar or better than ITO plates. Although ITO is supreme as a material, it is quite expensive due to the low abundance



of In and deposition involving vacuum sputtering. The price of a ITO coated plate depends critically on its sheet resistance; as ultralow sheet resistance ( $< 5 \text{ ohm/square}$ ) is possible only for thickness above 2000 nm which is to be achieved through prolonged deposition, the cost can shoot up several times non-linearly. To overcome this issue of non-uniform electric field in metal mesh electrode, a hybrid electrode fabricated, in which, a thin conducting layer of oxide SnO<sub>2</sub> is coated over Al- mesh by solution spray coating process. These electrodes are used to fabricate various prototype devices such as polymer dispersed liquid crystal (PDLC) based smart window shown in the pictures

Reference: Journal of Materials Chemistry A, 9, 23157-23168 (2021)

<https://www.cens.res.in/en/faculty/ramakrishna/profile>





## Kavita Pandey

Kavita Pandey holds a Master's (2011) and PhD degree (2016) in Physics, both obtained in India. During her PhD, she spent six months as a Newton Bhabha Fellow in Fraser Armstrong's group at the University of Oxford. She then went on to work at Ecole Polytechnique Federale de Lausanne (EPFL, Switzerland) to investigate the in-situ electrochemical processes inside a live battery using a transmission electron microscope (TEM). She then re-joined the Armstrong group in 2018 as an awardee of a SERB Overseas Postdoctoral Fellowship from the Indian Government.

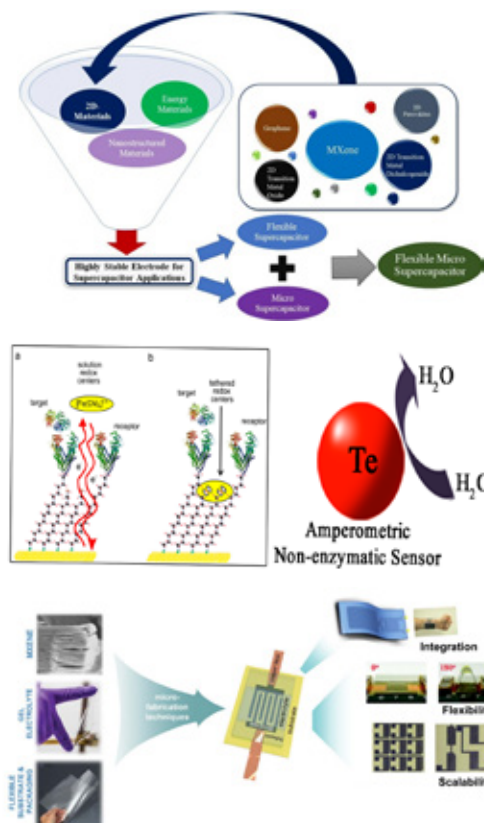
### Ph.D Students

Sabiar Rahaman  
Kaifee Sayeed  
Vigneshraaj  
Arya K  
Aadil Rashid Lone

## RESEARCH HIGHLIGHTS

### Smart Self Powered wearable electronics

The fully integrated smartwatch realizes energy harvesting/storage, biosensing, signal processing, and display in a single platform to achieve a self-powered sweat glucose monitoring system, paving the way for daily healthcare. Wearable devices for health monitoring and fitness management have foreseen a rapidly expanding market, especially those for non-invasive and continuous measurements with real-time display that provide practical convenience and eliminated safety/infection risks. Our group focuses on the development of a self-powered and fully integrated smartwatch that consists of flexible photovoltaic cells and rechargeable batteries in the forms of a "watch strap", electrochemical glucose sensors, customized circuits, and display units integrated into a "dial" platform for real time and continuous monitoring of sweat glucose levels. The functionality of the smartwatch, including sweat glucose sensing, signal processing, and display, can be supported with the harvested/converted solar energy without external charging devices.



<https://cens.res.in/en/faculty/kavita-a-pandey>

<https://sites.google.com/view/kavitapandey-ker-g-cens/home?authuser=0>



## S Krishna Prasad

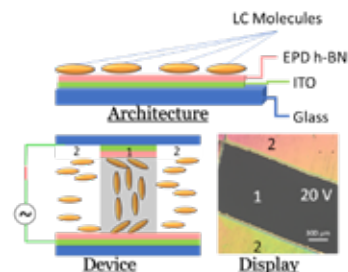
S Krishna Prasad obtained his PhD (1987) in physics from the Raman Research Institute (RRI), Bengaluru. He did his post-doctoral studies at the Technical University, Berlin and at the Naval research Laboratory, Washington D.C. Worked as a scientist at RRI before joining CeNS (the then CLCR), where he is currently an Honorary Scientist after superannuating as Scientist G. He is a Fellow of the Karnataka Science and Technology Academy (KSTA)

## RESEARCH HIGHLIGHTS

### Solution-processed layers of 2D material for molecular alignment in high-quality large area liquid crystal devices

We have just demonstrated that excellent quality alignment of liquid crystal (LC) molecules can be achieved using solution-processed layers of a well-known 2D material, h-BN. The alignment, a prerequisite for electro-optic devices including LCDs, is seen to be uniform over large areas, exceeding a few  $\text{cm}^2$

Reference: Adv. Mater. Interfaces 9, 2200486 (2022).



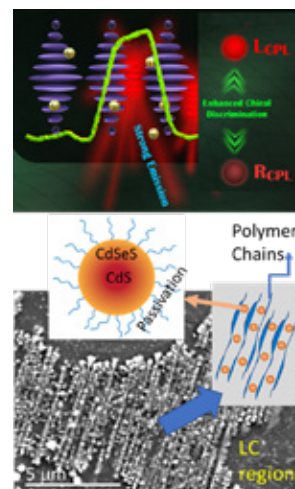
### Multiple and efficient pathways for anisotropic photoluminescence modulation in soft nanocomposites

We have been developing and demonstrating novel and efficient pathways for generating temporal and spatial modulation of emission in soft nanocomposites comprising liquid crystal as the host and either organic molecular or inorganic quantum emitters. The modulation created using electric field, actinic light or polymer network as the driving force, is also tailored towards obtaining high linear as well as circular polarized emission

See e.g., Adv. Opt. Mater. 7, 1801408 (2019).

ChemPhotoChem, 4, 582 (2020).

J. Mol. Liq. 347,118004 (2022)



# Academic programmes

## PhD Programme

The Centre is recognised by Mangalore University and Manipal Academy of Higher Education (MAHE). The students who enrol for the Ph D programme at the Centre, obtain their degree awarded by Mangalore University/MAHE.

**Admissions:** Applications are called for Ph.D. programme generally during March/April and Oct/Nov. Eligible candidates who have cleared the Masters programme in Physics/Chemistry/Materials Science/Nano Science and Technology (at least 60% aggregate marks for general category and 55% for SC/ST candidates) and also qualified in CSIR - UGC NET (JRF) / GATE / INSPIRE are encouraged to apply.

**Sponsored Candidates:** The Centre also encourages motivated candidates from recognized R&D organizations, academic institutions, government organizations as well as from industries to join Ph.D. programme at the Centre on a full-time basis. He / She must be a regular employee of the sponsoring organization and need not necessarily be qualified in any National Eligibility Test. They are expected to apply through proper channel by submitting a "No Objection Certificate (NOC)" from the employer along with the application. In the event of selection, a sponsorship letter from the organization will also be required at the time of admission. Research expenses including fees are to be met through sponsorship only.

## Course work

CeNS offers a variety of credit courses to students who have enrolled for their PhD. The courses are:

CPE-RPE	Research and Publication Ethics
CeNS-IP	Intellectual Property Rights
CeNS-NS	Basics of Nano and Soft Matter
CeNS-SW	Safety, Health & Waste Management
CeNS-IA	Instrumental methods & Analysis
CeNS-ED	Energy Materials and Devices
CeNS-NS	Basics of Nano and Soft Matter

## Skill Development Program @ CeNS (SDPC)

CeNS recently initiated SDPC program to share scientific skills and capabilities with the research community to carry out meaningful science for the benefit of our country and contribute to social scientific responsibilities. To enhance the job opportunities for students with a science background, CeNS offers certificate courses to provide hands-on training in the effective uses of various sophisticated instruments such as 3D printers, Electronic microscope, Surface Stylus Profilometer etc.

## Seminars

During the PhD programme, students deliver Journal-based Seminar, Thematic Seminar and Thesis Colloquium.

# Students

## Ph.D. awarded

Anamul Haque
Brindhu S Malani
Gaurav Shukla
Indrajit Mondal
Madhu Babu Kanakala
Marlin Baral
Rajashekhar Pujar
Sachin Ashok Bhat
Subir Roy

## Ph.D. Students

Aadil Rashid Lone	Mukhesh K G
Abhishek Kumar	Muskan
Abhishek Roy	Nikhil N. Rao
Aishwarya Mungale	Nurjahan Khatun
Alex C	Palash Jyoti Gogoi
Amit Bharadwaj	Pinchu Xavier
Amir Sohel	Pragnya Satapathy
Anusha Dsouza	Prashanth Nayak
Athira Chandran M	Pritha Dutta
Athira M	Priyabrata Sahoo
Arya K	Radha Rathod
Arya Somayajula Anand Eswara Rao	Rahul Deb Roy
Dev Sankar Choudhuri	Rahul Singh
Fathima Shafna K K	Rajalaxmi Sahoo
Ganesha Mahendra	Ramesh Chandra Sahoo
Gayathri R Pisharody	Ramya Prabhu
G V Varshini	Rekha S Hegde
Harshit Pandey	Rohit Thakur
Jil Rose Perutil	Sabiar Rahaman
Kaiffee Sayeed	Savithri Vishwanathan
Kenneth Lobo	Suchithra P
Manish Verma	Swathi S P
Modasser Hossain	Trupthi Devaiah
Moram Veera Manikanta Tatayya Naidu	Ushita Roy
Mouli Das	Vigneshraaj A. S
Muhammed Safeer N K	Vishnu G. Nath

### Industry Sponsored Ph.D. Students

Himani Saini

Rahul M

### Research Associates

Santosh Y Khatavi

Suresh Babu

Vijay Kumar

Vimala S

### Visiting Students

Alex Sam  
SRM Institute of Technology

Indrajit Mondal  
JNCASR Bengaluru

Satish A Ture  
Research Scholar, Gulbarga University

Sonali M K  
Research Scholar, MAHE

### R & D/project Assistants

Amit Kumar Gupta

Benexy Correya

Deeksha G

Deepak Kumar Tamudia

Hafis Kakkeem

Harshitha R

Jaisas Jeni Chandran

Manjula P

Mayur N

Mithun

M.N.Rajendra

Rajesh P.R

Reetu K

Savitha N

S S Inchal

Sumana S

# Laboratory Facilities

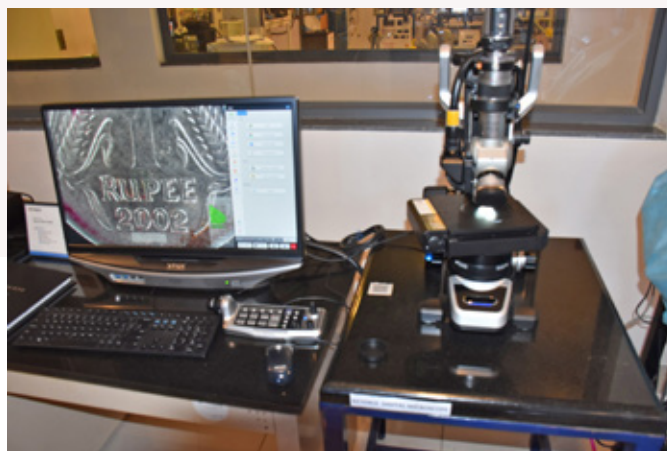
## Central Research Facility

The Central Research Facility (CRF) at CeNS offers access to scientific research facilities to researchers from CeNS and other academic institutions and industries. The mission of the CRF is to share scientific skills and capabilities with the research community to carry out meaningful science for the benefit of our country and contribute to social scientific responsibilities. The facility provides expert technical support enabling efficient data collection with feasibility to analyse and interpret the data. Housed in the spacious, functional, and aesthetically built "Materials Laboratory", the facility is managed by a team of professional staff. There are currently ~ 70 sophisticated research facilities under CRF, and the number of instruments is growing. CRF has seven laboratories dedicated to diffraction and thermal characterization, fabrication of various devices, gas sensors, energy research, spectroscopy and optical microscopy, electron microscopy and a process laboratory.

Apart from CeNS researchers, there are around 650 researchers from various academia and industries who use this facility. An easy-to-follow online registration process guides one through non-negotiable terms and conditions and enables one to become a registered user to the CRF within two working days. Once the registration is approved, the user will be able to view the available booking slots of each equipment, and request for slot-booking. The list of instruments and details of accessing the CRF is available at <http://crf.cens.res.in/>



Researchers collecting microscopic images using FESEM



Keyence Digital Microscope



Microwave Synthesizer



Surface Stylus Profilometer

3D Powder Mixer / Milling

3D Printer, Single Plastic Extruder or Dual plastic Extruder

Atomic Force Microscope (AFM)

Ball milling

Battery tester

BET Surface Area

Circular Dichroism

COMSOL Multiphysics with Wave optics module

Confocal Optical Polarizing Microscope

Contact Angle meter

Dark Field Microscope

Dispersion Analyzer

Electrophoretic Deposition

Electrochemical work station

Elemental Analyzer

Ellipsometer

Environmental Test chamber

Field Emission Scanning Electron Microscope

Fourier Transform Infrared Spectrometer

Geer type Oven

Glove Box and Thermal Evaporator

Hand held UV-Vis Spectrometer

Homogenizer

Hot Press Machine

IQE/EQE Measurement System

ITO/AZO coating System

Keyence Digital Microscope

Micro GC

Microwave Synthesizer

Non-contact Sheet resistance meter

Optical Polarizing Microscope

Particle Size Analyzer

Projection Lithography

Plasma Cleaner

Probe Station and Electrical Measurement System 4200

Probe Sonicator

Raman Microscope

Reactive Ion-Etching System

Rigaku SmartLab X-ray diffractometer

Screen Printing

Slot Die Coater

Solar Simulator

Spectrofluorometer

Spray pyrolysis

Surface Stylus Profilometer

Tabletop Sputtering

TGA /DTA

Thermal Evaporation System

Thermal Imaging Camera

Thin film applicator

Transmission Electron Microscope

UV-Vis-NIR spectrometer

Video-measuring System

Xenocs X-ray diffractometer (SAXS/WAXS)

# Outreach Programme

## Research Outreach Initiative (ROI)

The ROI programme provides first-hand experience in front-line research to highly motivated students pursuing a post-graduate course in Physics/Chemistry/Materials Science. Due to covid pandemic it was put on hold temporarily.

## विज्ञान-विद्यार्थिविचारविनिमय

### (V4: Science Programme@CeNS)

The novel science initiation programme V4 is aimed at students studying in the high school/+2 level to stimulate and nurture scientific curiosity in young minds. During the year 2021 to 2022, 6086 students benefitted from this programme.

Under this program the visiting school children will listen to an interesting lecture of general interest followed by hands-on experience of scientific demonstrations-an important component of Centre's flourishing science outreach programme. V4 program is held at outside CeNS as well. Outbound programs were conducted at RN Shetty PU College Murudeshwar on 25 Feb, 2022, Prof. B L V Prasad gave a special lecture on "Let Us Learn to Lead "Nanoscience" in Materials Research "Nanolithography". Dr Pralay gave a talk on "Nanoscience for Materials Research" on 1 Oct,2021 at Ramamnanda College, Bishnupur, West Bengal and Dr C V Yelamaggad gave Special lecture on "Nano and Soft Materials for Social Needs" at P. C. Jabin Science College, Hubballi and Vidhya Vardhak sangha's V. B. Darbar P.U College, Bijapur on 6 & 7 Aug, 2021.





## National Science Day

The Centre celebrated the National Science Day on 1st March 2021. Students at the 9<sup>th</sup> and 10<sup>th</sup> standard level and their science teachers from the Government high school, Hullegoudana Halli, Bangalore North were invited to actively participate in the event. The programme began with a video introduction to the research activities of CeNS. Prof. G.U.Kulkarni, the Director of the Centre was the Chief Guest. In his address Prof. Kulkarni stressed on the importance of the Day, how students should make best use of their free time and develop scientific curiosity. As an example, he quoted the case of unique face mask designed and fabricated during the lockdown period by a few researchers of the Centre, and now commercialized. After a short video



clip on the life and works of Prof. C.V. Raman, a number of short, but interesting science demonstrations were conducted catering to the academic level of the visiting

students. The demonstrations conducted by the research students of the Centre included a simple apparatus to realize Raman effect, visualization of simple optical effects using laser beams, generating irregularly shaped soap bubbles, a lay-man's chemical method to prevent corruption, magnetic levitation, Leiden frost effect, emission of colours from nanocrystals, non-standard rheological materials, wonders from pencil writing, de-fogging and electrically switchable smart windows. The demonstration was followed by a brief explanation of the involved phenomena and where it gets applied.

The event that lasted a little over 2 hours, was seen to be thoroughly enjoyed and appreciated by the visiting students and teachers, an indication of which also seen in the post-event feedback.

## IISF Expo 2021

CeNS represented by Mr. Vishnu G Nath, Mr. Rahul deb Roy and Dr.P. Viswanath actively participated in the 7th edition of the India International Science Festival (IISF 2021), Panaji, Goa from December 10 to 13, 2021. This Mega Science, Technology and Industry Expo was organised by the Ministry of Earth Sciences, Ministry of Science & Technology and Vijnana Bharati along with the Government of Goa. National Centre for Polar and Ocean Research acted as nodal agency to organise IISF 2021. The mission statement, research and outreach activities along with other services (like central research facility) offered by CeNS were shared with the visitors through posters. Further, some of the recent inventions and prototypes (like triboelectric mask, invisible electromagnetic shield fabricated using crackle lithography, graphene coated transparent conductive glass, gas sensors and so on) developed at CeNS were showcased which largely coincides with the theme of the event, 'Celebrating Creativity



in Science, Technology and Innovation for Prosperous India'. Researchers of CeNS explained the working principle of these prototypes and demonstrated them to visitors representing different industry and academic institutions. It also caught the attention of many young and enthusiastic college and school students who visited the stall and posed several interesting queries.

## Bengaluru INDIA NANO

India's Flagship Nanotech Event Bengaluru INDIA NANO is an excellent platform bridging Nanotech Research, Industry, Government and Academia successfully over the last 11 years. The event is organized by the Department of Electronics, IT, BT and S&T, Government of Karnataka under the guidance of Vision Group on Nanotechnology led by Prof. C.N.R. Rao, FRS, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR). The Event is aimed at giving fillip to the growth of Nanotech Industry in the country. The 12<sup>th</sup> edition of 'BENGALURU INDIA NANO 2022' was held from 7<sup>th</sup> – 8<sup>th</sup> March, 2022 and Tutorials on 9<sup>th</sup> March, 2022 in the Virtual Format with the central theme

'NanoTech for Sustainable Future'. The 3 Days BIN Exhibition brought together Researchers, Scientist's, Professors, and Industrialists together on a single Virtual Platform.

Virtual Expo gave a platform during COVID – 19 pandemics to communicate / promote our Green House prototypes to a Global audience by setup stalls, provide chat forums and enable online Interactions which also helped to promote the Green House through the EXPO. The Conference was open for public and approximately 110 people were visited the CeNS stall. In these 3 days exhibition a greater number of Researchers/scientists visited our stall. Information was shared with them regarding our Prototypes such as mist driven smart window, antimicrobial nano formulation, triboelectric face mask etc. Mr. Muhammed Safeer N K, Ph.D. student from CeNS was awarded Best Poster Prize for his presentation titled 'One in a million: Ni<sup>3+</sup> in Ni<sub>2</sub>O<sub>3</sub> that loves urea and hates CO<sub>2</sub>' during the event.

CeNS took an active role in organizing the the National Nano Quiz during 12<sup>th</sup> Bengaluru India Nano, which witnessed a keen contest among all the finalists. Preliminaries and Zonal round were conducted across India where-in 650+ contestants participated.

# Conferences/Workshops

## WORKSHOP

### CRF Orientation Workshop

Greenhouse, the TBI project, CeNS organised a one-day event “CRF Orientation Workshop” on 25 June 2021 for the benefit of CeNS researchers and R&D assistants, and technical staff. The workshop was organized mainly to orient the researchers regarding the various facilities offered and also to address the various aspects of the overall functioning of the facility. The Director and, Coordinator R&D gave an overview of CRF functioning. The CRF coordinator detailed out the operational aspects of CRF and the faculty in charges of various labs, gave a glimpse of different labs located under CRF. More than 60 registered participants attended the event done in a hybrid mode.



# Annual Events

## International Yoga Day

International Yoga Day was celebrated on 21 Jun 2021. The Centre organized jointly with JNCASR, Bangalore, an online lecture by Yoga Guru, Shri Prasanna V Raju of “Prabha, vyayamrathna” fame. The lecture emphasized the benefits of Yoga for both mental and physical well-being.

## National Handloom Day

In order to honor the handloom weavers and their immense contribution to the socio-economic development of India, the entire CeNS community wore dresses made of handloom to work on National Handloom Day.

## Independence Day

Responding to the call of the Government of India to mark the commencement of the 75<sup>th</sup> year of independence, CeNSians participated in the Fit India Freedom Run 2.0 event. CeNS organized a 5.0 km / 3.0 km Walkathon. Enthusiastic walkers, runners, and bikers brought a lot of cheer to the event.



## Nutrition Week

At CeNS, on account of the Nutrition week, a Nutrition Day was celebrated on September 7, 2021. The Dining at CeNS served nearly zero-oil, whole plant-based food for breakfast, and lunch.



## Hindi Pakhwara

The Hindi Pakhwada celebrated from 14-30<sup>th</sup> September 2021. Hindi Rajbhasha Committee organised various programs such as quick sentence formation, dictation, Hindi translation, Hindi reading, essay, and seminar.



## Vigilance Awareness Week

Vigilance Awareness Week was observed from October 26 to November 1, 2021. Dr Senthil Kumar, a retired officer from BHE gave a special lecture on “Better understanding of system and procedures in the procurement cycle and Vigilance Awareness”. He described at length several aspects of vigilance associated with everyday life and the happenings in the office.



## Samvidhan Divas

Samvidhan Divas was celebrated on November 26, 2021, to commemorate the adoption of our Constitution on this day in 1949. CeNSians



joined Hon'ble President of India Shri Ramnath Kovind for a community reading of the Preamble to the Constitution.

### 8<sup>th</sup> Anniversary of Sexual Harassment of Women at Workplace Act-2013

To commemorate the 8<sup>th</sup> anniversary of "Sexual Harassment of Women at Workplace Act, 2013", and to bring awareness among the community about the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013, two special lectures were arranged on 9th December 2021 through online mode.



### World Cancer Day

Dr. P Guru Suhas, Manager, Medical Screening, ICS, Dr. Anjali Rao, Management Committee Member, ICS, gave a presentation on the "World Cancer Day" occasion on Feb. 11, 2022, on the occasion of World Cancer Day.



Dr. Suhas presented on "Cancer Awareness". Dr. Anjali Rao presented "An overview of Breast and Cervical Cancers".

### International Women's Day

CeNS celebrated International Women's Day-2022 on 14 March 2022 with an event highlighting the importance of sustainable menstruation practices. Rotarian Ms. Nisha Bellare, founder of revaeconauts, which promotes new age menstrual hygiene products like the nariyari Menstrual Cups and cloth pads, and Ms. Uma Khemuka, homemaker, presented a special lecture titled "Roopantara - Transformation - A talk on sustainable menstruation".



# Camps

## Eye screening camp

CeNS, in association with Rotary Club of Cubbon Park, conducted an Eye screening camp on 16 September 2021. Medical professionals from Sharada Eye care Trust helped to conduct the camp. The eye screening checkup benefitted about 110 CeNSians on the campus.

## Blood Donation Camp

CeNS, in association with the Indian Red Cross Society and Rotary Club, Cubbon Park, Bengaluru, organized a Blood Donation camp on December 2 2021. More than 70 CeNSians, including faculty, research students, admin, and support staff, participated enthusiastically, and 32 CeNSians donated blood.

# Competitions

## Amrit Vaakya (or Slogan)

An Amrit Vaakya (or Slogan) contest inviting entries from CeNSians in English or in any other Official Indian Language, or both, on the theme "Science has transformed post-independent India".

## World Intellectual Property (IP) Day

The "World Intellectual Property (I.P.) Day" is celebrated every year on 26 April, intending to learn about the role of I.P. rights in encouraging innovation and creativity. The theme for 2021 is I.P. and S.M.E.s: Taking your ideas to market. Greenhouse (T.B.I., Nano Mission Project), CeNS in collaboration with Legasis Services (empaneled I.P. firm with CeNS), organized an online event on 26 April 2021. Industry experts from India, Japan, Australia, U.A.E. and U.S. shared their views and practical guidance on how start-ups and small and mid-size enterprises (S.M.E.s) can leverage

I.P. The I.P. Hackathon contest was also conducted from 29 April to 1 May. The researchers from CeNS, individually and in groups, participated in the event and provided an innovative solution to the problem statements. Based on the evaluation of the ideas received from the perspective of originality three winners were identified.

## Essay competition to celebrate "National Girl Child Day

"An Essay Competition was held to celebrate National Girl Child Day from 19-25 Jan 2022. Entries were invited on the theme "Girl child Education".

## Poetry Competition

To mark World Poetry Day (21 March 2022), a Poetry Competition was held as part of Azadi Ka Amrit Mahotsav (AKAM) celebrations at CeNS. Submissions for this contest, in English or in any other Official Indian Language, or both, were invited.

## Painting Challenge

A painting challenge was organized wherein two themes for the competition were floated. The one “Art inspired by your Work” was for CeNSians and “Green energy and green building” for CeNSians’ family members aged 6 to 10yrs.



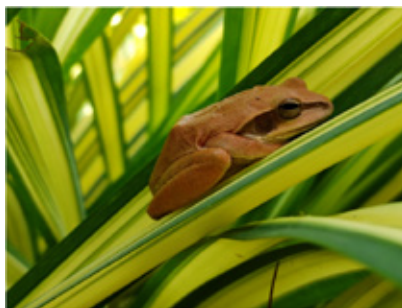
Ms. Swathi S P



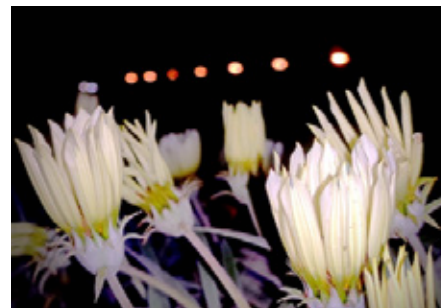
Ms. Hrithika Angappane

## Nature Mahotsav -A photography competition

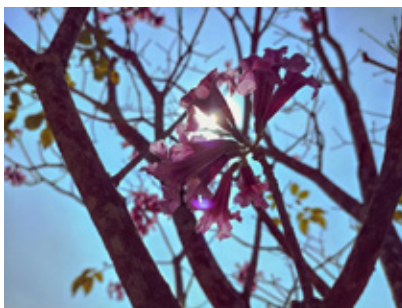
CeNS had arranged a special photography competition, “Nature Mahotsav” during 2-10 Feb 2022 to showcase the natural beauty of the campus.



Mr. Subir Roy



Mr. Gaurav Shukla



Dr Sreejesh M

# Special Lectures/Awareness Talks

- Dr. M. S. Rajanna, M.D, Former Prof and HOD Community Medicine SSMC Tumkur, **Healthcare in India: Post Independence Scenario**, Special lecture on occasion of World Health Day. **7 April 2021**

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- Dr Ganesh T, ATREE Bengaluru, **Let the park be green: becoming conscious and proactive to protect our environment**, on occasion of World Environmental Day. **5 June 2021**

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- Dr Arun M. Isloor, Professor & Head, Department of Chemistry, NIT-Suratkal, Mangalore, **Motivational entrepreneurs for young researchers.** **14 June 2021**

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- Dr. Pramoda Kumar Nayak, IIT-Madras, **Twistronics: A Recent Avenue in van der Waals Heterostructures.** **21 June 2021**

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- Prof. S. Sivaram, Honorary Professor and INSA Senior Scientist, IISER Pune, **Sustainable Science: Embedding Systems Thinking in Research and Innovation**, on occasion of Teacher's Day. **3 September 2021**

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- Padma Shri, Prahlada Ramarao, Director, Centre for Energy Research, S-VYASA University, Bengaluru, India **warming up to cold fusion.** **12 October 2021**

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- Dr Ali Khwaja, Founder and Head, Banjara Academy RT Nagar, Bengaluru, **Enriching Life through Better Relationships**, on occasion of World Mental Health Day. **25 October 2021**

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- Mr. G. Senthil Kumar, GM, Vigilance Officer, BHEL, Bangalore, **better understanding of system and procedures in procurement cycle and Vigilance Awareness on Vigilance Awareness Week 2021.** **29 October 2021**

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- Prof. S. Umapathy, Director, IISER, Bhopal, **Laser spectroscopy: From physics to chemistry, biology and medicine**, on occasion of Sir. C.V. Raman's Birthday. **12 November 2021**

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- Dr. V. Premnath, Head, NCL Innovations at CSIR-NCL, Founder Director, Venture Centre, **Science-based deep tech startups: Some learnings and insights from Venture Center.** **18 November 2021**

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- Dr. Swati Dyahadroy, Assistant Professor, Women's Studies Centre, University of Pune, Pune, **Understanding Gender: Issues and Challenges.** **9 December 2021**

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- Dr Durba Sengupta, Senior Scientist, National Chemical Laboratory, Pune, **Women Researchers in Indian Academia.** **9 December 2021**

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- Dr Sanjay K Varshney, Adviser & Head - International Cooperation, DST, **Approaches and Strategies for India's scientific cooperation.** **19 January 2021**

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- Prof. H A Upendra, Former Dean, Veterinary College, Bangalore, **Victory over Polio-Lessons Learnt**, on Occasion of National Immunization Day. **19 January 2021**

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- Dr Guru Suhas, Manager, Medical screening, ICS & Dr Anjali Rao, Management Committee member, ICS, **Cancer Awareness & An Overview of Breast and Cervical Cancers.** **11 February 2022**

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- Prof. Sabyasachi Bhattacharya, Director, TCG-CREST, Kolkata, **Perfectly Reasonable Approximations: Dealing with the real world**, Special Lecture on occasion of National Science Day. **28 February 2022**

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- Mr. Daniel Sukumar, Conservationist, Wildlife researcher, **Tale of Tiger**, Special Lecture on occasion of World wildlife Day. **7 March 2022**

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- Ms Nisha Bellare & Uma Khemuka, Founder of Reva Ecnauts, **Roopantara - Transformation - A talk on sustainable menstruation** Special lecture on International Women's Day. **11 March 2022**



# Administrative Staff

Subhod M. Gulvady	Administrative & Finance Officer
Vivek Dubey	Accounts Officer
P. Nethravathi	Asst. Administrative Officer
Dr. Sanjay K. Varshney	Technical Assistant
Sandhya D. Hombal	Technical Assistant
M. Jayaram	Assistant
Nayana. J	Library Assistant
Jayaprakash V K	Support Staff

## Contract staff

Dr. Archana M L V	Authorized Medical Officer
Mr. Tharakanath K	Site Engineer
Ms. Jyothi. U. V	Senior Administrative Assistant
Mr. Deepak S	Senior Administrative Assistant
Mr. Indresh S	Website Management
Mrs. Shruthi S K	Medical attendant
Mr. Venkatesh K	Administrative Assistant
Ms. Khanubi	Office Assistant (Front desk)
Mrs. Ranjitha Bhat	Administrative Assistant
Mrs. Usha Harini	Office Assistant
Mrs. Vathsala K. N	Office Assistant
Mrs. Roopa	Office Assistant
Mr. Girish C	Office Assistant (Safety Management)

## Consultant

Narayana M. G	Consultant
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## Maintenance Staff

### Housekeeping Staff

Dhanalakshmi	Gangaraju
Lakshmi devi (H/K)	Lakshmi Y. N
Muniswamy	Parvathamma
Penchilaiah	Thirumalesh
Vijaya	

### Dining Hall

Anitha	Gowramma
Hanumanthe Gowda	Harini
Joseph	Lakshmi Devi (Canteen)
Manjula V	Narsimhamurthy
Rohith K	Sunitha
Venkatesh R	

### Hostel/Guest House

Mangala Govindhamma	Venkatesh Ramaiah
Yanisa Liyonara Vijaya	Yashodha R
Y. N Rathnamma	

### Technical Staff

Kumaravel	Krishnappa C
Murthy G	Sumanth. M

### Office Help

Prahalad D G	Praveen
Samuel V Hebich	

### Gardening Staff

Anandanappa	Anand Kumar
Chethan	Devraju
Earanna	Ganga Lakshamma
Rakesh	Surya Kanthi

### Lab Assistant

Raghavendra D S	
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### Security Staff

Basanagouda S	Bommayya V Nayak
Chikkanna T	Ganesh Kumar R
Ganga Raju	Jatappa
Kenchappa	L. Venkatesh
M Mahesha	Madhugiriyappa
Mahesh Kumar T E	Nanje Gowda
Naveen Kumar S	Prakash N
Praveen Kumar	Raghu C
Rajesheakraih H. V	Rajshekhar
Ramanjaneya	Ranganatha M
S. Vinay Kumar	Shiva Shankar

# Honours & Awards

## AWARDS

- Prof. B L V Prasad, Director CeNS, was awarded Gold Medal Lecture –Chirantan Rasayan Sanstha, Vidya Sagar University, Midnapore, West Bengal, India (2021)
- Dr C V Yelamaggad has been conferred with prestigious Bronze Medal by the Chemical Research Society of India for his remarkable contribution in the field of Chemistry, especially liquids crystals (2021)
- Prof. B L V Prasad, Director, has been conferred the highly prestigious C N R Rao National Prize for Chemical Research by the Chemical Research Society of India (CRSI) at Kolkata. (2021)
- Prof. G.U. Kulkarni, Adjunct Professor, CeNS, has been awarded the Karnataka Rajyotsava Award 2021 in the area of Science and Technology. He received the award on November 01, 2021.

## HONOURS

- Prof. B L V Prasad invited as "Associate Editor" Journal of Chemical Sciences (Indian Academy of Sciences and Springer)
- Dr Geetha G Nair, invited as Internal Quality Assurance Cell member JNCASR, Bengaluru
- Dr. S. Angappane received "Certificate of Reviewer Excellence 2020" from Bulletin of Materials Science for the year 2021
- Dr. Pralay K Santra invited as Early Career Editorial Advisory Board Member, 'ChemNanoMat', Wiley-VCH Publications, 2021

- Dr S Krishna Prasad has been conferred the Fellowship of the Karnataka Science and Technology Academy (KSTA), 2021 for his significant contributions in the area of Science & Technology (2021)
- Prof. G U Kulkarni, Adjunct Professor, CeNS, is honoured with CRS Gold Medal by Chirantan Rasayan Sanstha for academic achievement.
- Prof. G.U. Kulkarni, Adjunct Professor, CeNS, has been elected as Fellow of the Indian National Academy of Sciences (INSA), New Delhi, for his significant contribution in the area of Material Chemistry. (2022)
- Prof G U Kulkarni, Adjunct Professor, CeNS has been elected as the Fellow of the Indian National Academy of Engineering (INAE) for his significant contribution in Interdisciplinary and Special Engineering Fields and Leadership in Academia, R&D and Industry.
- Dr. Ashutosh K Singh, Scientist CeNS was awarded "Six Sigma green belt" certification from Indian Statistical Institute (ISI) Bangalore, 31 October 2021.

## AWARDS TO STUDENTS

- Mr. Muhammed Safeer N K was awarded Best Poster Prize during 12th Bengaluru Nano, 7-8 Mar, 2022, for the poster titled 'One in a million: Ni<sup>3+</sup> in Ni<sub>2</sub>O<sub>3</sub> that loves urea and hates CO<sub>2</sub>
- Ms. Trupathi Devaiah has received one of the Best Poster prizes sponsored by the Journal of Materials Chemistry C at the Interdisciplinary Topics in Materials Science (ITAM-2021) conference. July 27-30 2021, for poster titled "Degradation Studies of Cs<sub>3</sub>Sb<sub>2</sub>I<sub>9</sub>: A Lead-Free Perovskite."

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- Dr. S. Vimala, Research Associate, won 1<sup>st</sup> position in the "IP Hackathon" conducted by CeNS and Legasis, Pune, 29-30 April, 2021, under the auspices of "Aazadi ka Amrita Mahotsav".

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  - Ms. Ramya Prabhu B, SRF, was awarded best oral presentation award for her work 'Self-cleaning spiky mixed metal oxide nanoformulation for antimicrobial applications' during Third Indian Materials conclave and 32nd Annual General Meeting of MRSI (Theme symposium: Nanomaterial synthesis and solution route), held in virtual mode organized by IIT-M, Dec 20-22, 2021

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  - Ms. Ramya Prabhu, PhD student won second place in "IP Hackathon" conducted by CeNS and Legasis, Pune, 29-30 April, 2021, under the auspices of "Aazadi ka Amrit Mahotsav".
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# CeNS in News

## Media cell

Sl. No	Name of the article	Name of the Researcher	Link
1.	Nano Jatha- workshop at Pondicherry fosters Nanotech business environment	The workshop under the umbrella of 'Nano Jatha- Lecture series, Road show and Exhibition	<a href="https://dst.gov.in/pressrelease/nano-jatha-workshop-pondicherry-fosters-nanotech-business-environment">https://dst.gov.in/pressrelease/nano-jatha-workshop-pondicherry-fosters-nanotech-business-environment</a>
2.	Bengaluru Scientists develop smart switchable window that can 'fog' on demand	Dr. S. Krishna Prasad	<a href="https://dst.gov.in/pressrelease/bengaluru-scientists-develop-smart-switchable-window-can-fog-demand">https://dst.gov.in/pressrelease/bengaluru-scientists-develop-smart-switchable-window-can-fog-demand</a>
3.	Bangalore scientists develop real-time breath monitoring device which can detect asthma, sleep apnoea	Prof. G.U. Kulkarni	<a href="https://dst.gov.in/pressrelease/bangalore-scientists-develop-real-time-breath-monitoring-device-which-can-detect-asthma">https://dst.gov.in/pressrelease/bangalore-scientists-develop-real-time-breath-monitoring-device-which-can-detect-asthma</a>
4.	Bengaluru scientists pave the way for novel glucose sensors	Dr. HSSR Matte	<a href="https://dst.gov.in/pressrelease/bengaluru-scientists-pave-way-novel-glucose-sensors">https://dst.gov.in/pressrelease/bengaluru-scientists-pave-way-novel-glucose-sensors</a>
5.	PG students exposed to recent advances in Nano Science at Special Lecture Series	Workshop jointly organised by KSTA and CeNS	<a href="https://dst.gov.in/pressrelease/pg-students-exposed-recent-advances-nano-science-special-lecture-series">https://dst.gov.in/pressrelease/pg-students-exposed-recent-advances-nano-science-special-lecture-series</a>
6.	Graphene from sugar, a sweet protocol	Prof. G. U. Kulkarni	<a href="https://dst.gov.in/pressrelease/graphene-sugar-sweet-protocol">https://dst.gov.in/pressrelease/graphene-sugar-sweet-protocol</a>
7.	National Science Day celebrated at CeNS	Prof. Ranjini Bandyopadhyay	<a href="https://dst.gov.in/pressrelease/national-science-day-celebrated-cens">https://dst.gov.in/pressrelease/national-science-day-celebrated-cens</a>
8.	CeNS develops portable sensor to ease heavy metal detection in water	Dr. Pralay. K. Santra	<a href="https://dst.gov.in/cens-develops-portable-sensor-ease-heavy-metal-detection-water">https://dst.gov.in/cens-develops-portable-sensor-ease-heavy-metal-detection-water</a>
9.	CeNSs gold nanostructure substrate can detect interaction between bio-molecules & chemicals in the lab	Dr. P. Viswanath	<a href="https://dst.gov.in/censs-gold-nanostructure-substrate-can-detect-interaction-between-bio-molecules-chemicals-lab">https://dst.gov.in/censs-gold-nanostructure-substrate-can-detect-interaction-between-bio-molecules-chemicals-lab</a>
10.	CeNS uses electrostatics of materials to develop Tribo E mask to protect healthy individuals from COVID 19	Dr. Pralay. K. Santra & Dr. Ashutosh Singh	<a href="https://dst.gov.in/cens-uses-electrostatics-materials-develop-tribo-e-mask-protect-healthy-individuals-covid-19">https://dst.gov.in/cens-uses-electrostatics-materials-develop-tribo-e-mask-protect-healthy-individuals-covid-19</a>

Sl. No	Name of the article	Name of the Researcher	Link
11.	Novel recipe for fabrication of Transparent Conducting Glass can bring down cost of smart windows, touch screens, solar cells	Prof. G. U. Kulkarni	<a href="https://dst.gov.in/novel-recipe-fabrication-transparent-conducting-glass-can-bring-down-cost-smart-windows-touch">https://dst.gov.in/novel-recipe-fabrication-transparent-conducting-glass-can-bring-down-cost-smart-windows-touch</a>
12.	CeNS synthesises novel photo-sensitive cholesteric liquid crystals for display devices at room temperature	Dr. Veena Prasad	<a href="https://dst.gov.in/cens-synthesises-novel-photo-sensitive-cholesteric-liquid-crystals-display-devices-room-temperature">https://dst.gov.in/cens-synthesises-novel-photo-sensitive-cholesteric-liquid-crystals-display-devices-room-temperature</a>
13.	CeNS develops low-cost catalyst for hydrogen generation from water	Dr. Neena S. John	<a href="https://dst.gov.in/cens-develops-low-cost-catalyst-hydrogen-generation-water">https://dst.gov.in/cens-develops-low-cost-catalyst-hydrogen-generation-water</a>
14.	CeNS develops humidity sensor for rapid measurement of relative humidity in labs & human breath analysis	Dr. S. Angappane	<a href="https://dst.gov.in/cens-develops-humidity-sensor-rapid-measurement-relative-humidity-labs-human-breath-analysis">https://dst.gov.in/cens-develops-humidity-sensor-rapid-measurement-relative-humidity-labs-human-breath-analysis</a>
15.	Juxtaposition of pathways can help intensify fluorescent dyes for biosensing applications	Dr. Krishna Prasad	<a href="https://dst.gov.in/juxtaposition-pathways-can-help-intensify-fluorescent-dyes-biosensing-applications">https://dst.gov.in/juxtaposition-pathways-can-help-intensify-fluorescent-dyes-biosensing-applications</a>
16.	Liquid crystal-based colloidal metamaterial useful in controlling scattering of light can be used in photonic devices	Dr. Geetha G. Nair	<a href="https://dst.gov.in/liquid-crystal-based-colloidal-metamaterial-useful-controlling-scattering-light-can-be-used-photonic">https://dst.gov.in/liquid-crystal-based-colloidal-metamaterial-useful-controlling-scattering-light-can-be-used-photonic</a>
17.	Bangalore based researchers synthesize durable, efficient, cost-effective catalyst for sustained & efficient Hydrogen Evolution	Dr. Neena S. John	<a href="https://dst.gov.in/bangalore-based-researchers-synthesize-durable-efficient-cost-effective-catalyst-sustained-efficient">https://dst.gov.in/bangalore-based-researchers-synthesize-durable-efficient-cost-effective-catalyst-sustained-efficient</a>
18.	CeNS surges ahead with COVID solutions & novel nano- and soft- functional materials.	Conducted by CeNS	<a href="https://dst.gov.in/cens-surges-ahead-covid-solutions-novel-nano-and-soft-functional-materials">https://dst.gov.in/cens-surges-ahead-covid-solutions-novel-nano-and-soft-functional-materials</a>
19.	Self-cleaning non-toxic colours developed by CeNS can brighten up textiles, automobiles, and decorations	Dr. Angappane	<a href="https://dst.gov.in/self-cleaning-non-toxic-colours-developed-cens-can-brighten-textiles-automobiles-and-decorations">https://dst.gov.in/self-cleaning-non-toxic-colours-developed-cens-can-brighten-textiles-automobiles-and-decorations</a>

Sl. No	Name of the article	Name of the Researcher	Link
20.	Indian scientists develop smart screens from discarded groundnut shells	Dr. S. Krishna Prasad	<a href="https://dst.gov.in/indian-scientists-develop-smart-screens-discarded-groundnut-shells">https://dst.gov.in/indian-scientists-develop-smart-screens-discarded-groundnut-shells</a>
21.	Supercapacitors step-up voltage window using organic nanofibres	Prof. G. U. Kulkarni	<a href="https://dst.gov.in/supercapacitors-step-voltage-window-using-organic-nanofibres">https://dst.gov.in/supercapacitors-step-voltage-window-using-organic-nanofibres</a>
22.	Scientists found new efficient method of producing disinfectant hydrogen peroxide	Dr. Neena S. John	<a href="https://dst.gov.in/scientists-found-new-efficient-method-producing-disinfectant-hydrogen-peroxide">https://dst.gov.in/scientists-found-new-efficient-method-producing-disinfectant-hydrogen-peroxide</a>
2021			
1.	Scientists develop gold microstructure substrate with tunable wettability useful in water transportation & self-cleaning	Dr. P. Viswanath	<a href="https://dst.gov.in/scientists-develop-gold-microstructure-substrate-tunable-wettability-useful-water-transportation">https://dst.gov.in/scientists-develop-gold-microstructure-substrate-tunable-wettability-useful-water-transportation</a>
2.	New material that can tune electromagnetic (EM) waves to scatter in one direction useful for thin-film solar cells	Dr. Geetha G. Nair	<a href="https://dst.gov.in/new-material-can-tune-electromagnetic-em-waves-scatter-one-direction-useful-thin-film-solar-cells">https://dst.gov.in/new-material-can-tune-electromagnetic-em-waves-scatter-one-direction-useful-thin-film-solar-cells</a>
3.	New electronic nose with biodegradable polymer and monomer can detect hydrogen sulphide from sewers	Dr. Yelamaggad	<a href="https://dst.gov.in/new-electronic-nose-biodegradable-polymer-and-monomer-can-detect-hydrogen-sulphide-sewers">https://dst.gov.in/new-electronic-nose-biodegradable-polymer-and-monomer-can-detect-hydrogen-sulphide-sewers</a>
4.	Cost-effective, bio-compatible nanogenerators can harvest electricity from vibrations for optoelectronics, self-powered devices	Dr. Shankar Rao	<a href="https://dst.gov.in/cost-effective-bio-compatible-nanogenerators-can-harvest-electricity-vibrations-optoelectronics-self">https://dst.gov.in/cost-effective-bio-compatible-nanogenerators-can-harvest-electricity-vibrations-optoelectronics-self</a>
5.	Liquid crystal-nanoparticle composites with nanoparticles synthesized from biowaste can reduce power consumption of display devices	Dr. Veena Prasad	<a href="https://dst.gov.in/liquid-crystal-nanoparticle-composites-nanoparticles-synthesized-biowaste-can-reduce-power">https://dst.gov.in/liquid-crystal-nanoparticle-composites-nanoparticles-synthesized-biowaste-can-reduce-power</a>

Sl. No	Name of the article	Name of the Researcher	Link
6.	Wealth from Waste: Spent catalyst from industry can be an efficient catalyst for batteries	Dr. Neena S John	<a href="https://dst.gov.in/wealth-waste-spent-catalyst-industry-can-be-efficient-catalyst-batteries">https://dst.gov.in/wealth-waste-spent-catalyst-industry-can-be-efficient-catalyst-batteries</a>
7.	Porous carbon nanoparticles from waste onion peels used for making soft actuators with enhanced photomechanical capacity	Dr. S. Krishna Prasad	<a href="https://dst.gov.in/porous-carbon-nanoparticles-waste-onion-peels-used-making-soft-actuators-enhanced-photomechanical">https://dst.gov.in/porous-carbon-nanoparticles-waste-onion-peels-used-making-soft-actuators-enhanced-photomechanical</a>
8.	Scalable synthesis method developed of nanocrystals with bright emission colours useful for LED	Dr. Pralay K. Santra	<a href="https://dst.gov.in/scalable-synthesis-method-developed-nanocrystals-bright-emission-colours-useful-led">https://dst.gov.in/scalable-synthesis-method-developed-nanocrystals-bright-emission-colours-useful-led</a>
9.	Silica nanoparticles developed by Indian Scientists can help design better drug delivery systems	Dr. B. L. V. Prasad	<a href="https://dst.gov.in/silica-nanoparticles-developed-indian-scientists-can-help-design-better-drug-delivery-systems">https://dst.gov.in/silica-nanoparticles-developed-indian-scientists-can-help-design-better-drug-delivery-systems</a>
<b>2022</b>			
1.	New method can efficiently transform phenol to a key ingredient for manufacturing food preservatives, pharmaceuticals & polymers	Prof. B. L. V. Prasad	<a href="https://dst.gov.in/new-method-can-efficiently-transform-phenol-key-ingredient-manufacturing-food-preservatives">https://dst.gov.in/new-method-can-efficiently-transform-phenol-key-ingredient-manufacturing-food-preservatives</a>
2.	Scientists develop energy-efficient hydrogen production by urea electrolysis	Dr. Neena S. John	<a href="https://dst.gov.in/scientists-develop-energy-efficient-hydrogen-production-urea-electrolysis">https://dst.gov.in/scientists-develop-energy-efficient-hydrogen-production-urea-electrolysis</a>
3.	Touchless touchscreen technology developed can restrain viruses spreading through contact	Dr. Ashutosh Singh	<a href="https://dst.gov.in/Touchless-touchscreen-technology-developed-can-restrain-viruses-spreading-through-contact">https://dst.gov.in/Touchless-touchscreen-technology-developed-can-restrain-viruses-spreading-through-contact</a>



## News Items

Title	Date Published	Name of the Newspaper	Link
Low-cost Hydrogen peroxide	Jan 3,2021	The Hindu	<a href="https://www.thehindubusinessline.com/business-tech/low-cost-hydrogen-peroxide/article33482355.ece">https://www.thehindubusinessline.com/business-tech/low-cost-hydrogen-peroxide/article33482355.ece</a>
Scientists develop gold microstructure substrate with tunable wettability useful in water transportation & self-cleaning	February 9,2021	The Tribune	<a href="https://www.tribuneindia.com/news/schools/scientists-develop-gold-micro-structure-substrate-that-can-repel-water-201209?fbclid=IwAR3jTyR8M81V9t5jKaJergkKrWkZ3eN5ZS_ijlWIWzLCGg18Kfc3rUM76pc">https://www.tribuneindia.com/news/schools/scientists-develop-gold-micro-structure-substrate-that-can-repel-water-201209?fbclid=IwAR3jTyR8M81V9t5jKaJergkKrWkZ3eN5ZS_ijlWIWzLCGg18Kfc3rUM76pc</a>
Scientists develop e-nose to detect noxious fumes	April 16,2021	Bangalore Mirror	<a href="https://bangaloremirror.indiatimes.com/bangalore/others/scientists-develop-e-nose-to-detect-noxious-fumes/articleshow/82090140.cms">https://bangaloremirror.indiatimes.com/bangalore/others/scientists-develop-e-nose-to-detect-noxious-fumes/articleshow/82090140.cms</a>
Bengaluru scientists pave the way for novel glucose sensors'		Dr. HSSR Matte	<a href="https://dst.gov.in/pressrelease/bengaluru-scientists-pave-way-novel-glucose-sensors">https://dst.gov.in/pressrelease/bengaluru-scientists-pave-way-novel-glucose-sensors</a>
Nanorod based oxygen sensor working at room temperature can save lives in places like underground mines, higher altitudes	June 4,2021	TV 9 Hindi, PIB India	<a href="https://www.tv9hindi.com/knowledge/nanorod-based-oxygen-sensor-working-at-room-temperature-can-save-lives-in-places-like-underground-mines-higher-altitudes-682757.html">https://www.tv9hindi.com/knowledge/nanorod-based-oxygen-sensor-working-at-room-temperature-can-save-lives-in-places-like-underground-mines-higher-altitudes-682757.html</a>
Scientists develop technique that can generate electricity from vibrations for self-powered devices	June 26,2021	The Economic Times	<a href="https://economictimes.indiatimes.com/news/science/scientists-develop-technique-that-can-generate-electricity-from-vibrations-for-self-powered-devices/articleshow/83874314.cms?">https://economictimes.indiatimes.com/news/science/scientists-develop-technique-that-can-generate-electricity-from-vibrations-for-self-powered-devices/articleshow/83874314.cms?</a>
Wealth from Waste: Spent catalyst from industry can be an efficient catalyst for batteries	July 6,2021	NewsOnAIR	<a href="https://newsonair.com/2021/07/07/wealth-from-waste-spent-catalyst-from-industry-can-be-an-efficient-catalyst-for-batteries/">https://newsonair.com/2021/07/07/wealth-from-waste-spent-catalyst-from-industry-can-be-an-efficient-catalyst-for-batteries/</a>
Scientists have created nanorod based oxygen sensor, with the help of which life can be saved in underground mines and high places	Jun 4,2021	NEWSNCR	<a href="https://www.newsnrcr.com/national/scientists-have-created-nanorod-based-oxygen-sensor-with-the-help-of-which-life-can-be-saved-in-underground-mines-and-high-places/">https://www.newsnrcr.com/national/scientists-have-created-nanorod-based-oxygen-sensor-with-the-help-of-which-life-can-be-saved-in-underground-mines-and-high-places/</a>

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Scientists have created nanorod based oxygen sensor, with the help of which life can be saved in underground mines and high places	Jun 4,2021	NEWSNCR	<a href="https://www.newsnrcr.com/national/scientists-have-created-nanorod-based-oxygen-sensor-with-the-help-of-which-life-can-be-saved-in-underground-mines-and-high-places/">https://www.newsnrcr.com/national/scientists-have-created-nanorod-based-oxygen-sensor-with-the-help-of-which-life-can-be-saved-in-underground-mines-and-high-places/</a>
Scalable synthesis method developed of Nano-crystals with bright emission colours useful for LED	Oct 5,2021	PIB	<a href="https://pib.gov.in/newsite/PrintRelease.aspx?relid=225357">https://pib.gov.in/newsite/PrintRelease.aspx?relid=225357</a>
Indian scientists' silica nanoparticles can help design better drug delivery systems	Dec 20,2021	Times of India	<a href="https://timesofindia.indiatimes.com/city/bengaluru/scientists-develop-silica-nanoparticles-for-better-systems-of-drug-delivery/articleshow/88442149.cms">https://timesofindia.indiatimes.com/city/bengaluru/scientists-develop-silica-nanoparticles-for-better-systems-of-drug-delivery/articleshow/88442149.cms</a>
New method can efficiently transform phenol to a key ingredient for manufacturing food preservatives, pharmaceuticals & polymers	Feb 3,2022	PIB India	<a href="https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1795038">https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1795038</a> .
Scientists develop energy-efficient hydrogen production by urea electrolysis	Mar 13,2022	The Hindu	<a href="https://www.thehindubusinessline.com/business-tech/hydrogen-from-electrolysis-of-urea/article65217146.ece">https://www.thehindubusinessline.com/business-tech/hydrogen-from-electrolysis-of-urea/article65217146.ece</a>

## Alumni (Ph.D.)

Marlin Baral	Suman Kundu	Pramoda Kumar
Indrajit Mondal	Brindhu S Malani	A.S. Achalkumar
Sunil Walia	Arup Sarkar	Chethan V.Lobo
K Priya Madhuri	Chandan Kumar	Manoj Mathews
Veerabhadraswamy B. N	Bramhaiah Kommula	Anitha Nagamani
Monika M	Gayathri H. N	G. Shanker
Srividhya Parthasarathi	Pappu Lakshmi Madhuri	Gurumurthy Hegde
T Shilpa Harish	Nagaiah Kambhala	I Shashikala
R. Rajalakshmi	Nagaveni N. G	K. L. Sandhya
VijayKumar. M	Rashmi Prabhu	Pramod Tadpatri
Bhargavi R	Prasad N Bapat	V. Jayalakshmi
Sachin A Bhat	S. Sridevi	

# Journal Publications 2021-2022

1. Alex. C, Sathiskumar. C & John. N. S. (2021). Role of Metal Ion Sites in Bivalent Cobalt Phosphorus Oxygen Systems toward Efficient Oxygen Evolution Reaction. *Journal of Physical Chemistry C*, 125, 24777-24786. doi: 10.1021/acs.jpcc.1c05614. Impact factor: 4.126
2. Alex, C., Shukla, G., & John, N. S. (2021). Introduction of surface defects in NiO with effective removal of adsorbed catalyst poisons for improved electrochemical urea oxidation. *Electrochimica Acta*, 385, 138425. doi: 10.1016/j.electacta.2021.138425.512. Impact factor: 6.901
3. Bhardwaj. A, Sridurai. V, Bhat, S. A, Yelamaggad, C. V, & Nair, G. G. (2021). Photo-tunable epsilon-nearzero behavior in a self-assembled liquid crystal - nanoparticle hybrid material. *Nanoscale Advances*, 3, 2508-2515. doi:10.1039/d0na01039a. Impact factor: 5.598
4. Bhat, S. A., Rao, D. S. S., Prasad, S. K., & Yelamaggad, C. V. (2021). Chiral plasmonic liquid crystal gold nanoparticles: self-assembly into a circular dichroism responsive helical lamellar superstructure. *Nanoscale Advances*, 3, 2269-2279. doi:10.1039/d0na01070g. Impact factor: 5.598
5. Bhuyan, P., Bhuyan, A. J., Gogoi, P. J., Mahanta, A., Tamuly, C., & Saikia, L. (2021). Pd-NPs@MMT-K10 Catalysis of Suzuki-Miyaura Cross-coupling Reaction: In Situ Generation and Ex Situ Use. *Catalysis Letters*, 152, 2705-2715. doi:10.1007/s10562-021-03841-z. Impact factor: 3.186
6. Bramhaiah, K., Bhuyan, R., Mandal, S., Kar, S., Prabhu, R., John, N. S., Gramlich, M., Urban, A. S. & Bhattacharyya, S. (2021). Molecular, Aromatic, and Amorphous Domains of N-Carbon Dots: Leading toward the Competitive Photoluminescence and Photocatalytic Properties. *Journal of Physical Chemistry C*, 125, 4299-4309. doi: 10.1021/acs.jpcc.1c00004. Impact factor: 4.126
7. Cherian, A. R., Benny, L., Varghese, A., John, N. S., & Hegde, G. (2021). Molecularly Imprinted Scaffold Based on poly (3-aminobenzoic acid) for Electrochemical Sensing of Vitamin B-6. *Journal of the Electrochemical Society*, 168, 077512. doi:10.1149/1945-7111/ac1494. Impact factor: 4.316
8. Chowdhury, A., Sasidharan, S., Xavier, P., Viswanath, P., & Raghunathan, V. A. (2021). Effect of pH on the phase behavior of DMPC bilayers. *Biochimica Et Biophysica Acta-Biomembranes*, 1863, 183695. doi: 10.1016/j.bbamem.2021.183695. Impact factor: 3.747
9. Eber, N., Buka, A., & Krishnamurthy, K. S. (2021). Electrically driven structures in bent-core nematics. *Liquid Crystals*, 49, 1194-1222. doi:10.1080/02678292.2021.1973129. Impact factor: 3.512
10. Govind, R. K., Mondal, I., Baishya, K., Ganesha, M. K., Walia, S., Singh, A. K., & Kulkarni, G. U. (2021). Large-Area Fabrication of High Performing, Flexible, Transparent Conducting Electrodes Using Screen Printing and Spray Coating Techniques. *Advanced Materials Technologies*, 7, 2101120. doi:10.1002/admt.202101120. Impact factor: 8.856
11. Gill, A., Boyce, M. M., O'Dea, C. P., Baum, S. A., Kharb, P., Campbell, N., Tremblay, G. R. & Kundu, S. (2021). Extended X-Ray Emission Associated with the Radio Lobes and the Environments of 60 Radio Galaxies. *Astrophysical Journal*, 912, 88. doi:10.3847/1538-4357/abec74. Impact factor: 5.874
12. Hossain, M., Chonamada, T. D., & Santra, P. K. (2021). Understanding the Transformation of 2D Layered Perovskites to 3D Perovskites in the Sonochemical Synthesis. *Journal of Physical Chemistry C*, 125, 12131-12139. doi: 10.1021/acs.jpcc.1c02227. Impact factor: 4.126
13. Jayaraman, N, & Prasad, S. K. (2021). B. K. Sadashiva (1946-2020). *Current Science*, 120, 1257-1258. Impact factor: 1.169

14. Jyothilal, H., Shukla, G., Walia, S., Bharath, S. P., & Angappane, S. (2021). UV assisted room temperature oxygen sensors using titanium dioxide nanostructures. *Materials Research Bulletin*, 140, 111324. doi: 10.1016/j.materresbull.2021.111324. Impact factor: 4.641
15. Kanakala, M. B., & Yelamaggad, C. V. (2021). Exceptional dual fluorescent, excited-state intramolecular proton-transfer (ESIPT) columnar liquid crystals characterized by J-stacking and large Stokes shifts. *Journal of Molecular Liquids*, 332, 115879. doi: 10.1016/j.molliq.2021.11587. Impact factor: 6.165
16. Kanakala, M. B., & Yelamaggad, C. V. (2021). Exceptionally Wide Thermal Range Enantiotropic Existence of a Highly Complex Twist Grain Boundary Phase in a Pure, Single-Component Liquid Crystal Chiral Dimer. *ACS Omega*, 6, 11556-11562. doi:10.1021/acsomega.1c00768. Impact factor: 4.312
17. Kar, S., Bramhaiah, K., John, N. S., & Bhattacharyya, S. (2021). Insight into the Multistate Emissive N, P-doped Carbon Nano-Onions: Emerging Visible-Light Absorption for Photocatalysis. *Chemistry-an Asian Journal*, 16, 1138-1149. doi:10.1002/asia.202100137. Impact factor: 4.568
18. Kempasiddaiah, M., Raj, K. A. S., Kandathil, V., Dateer, R. B., Sasidhar, B. S., Yelamaggad, C. V., Rout, C. S., & Patil, S. A. (2021). Waste biomass-derived carbon-supported palladium-based catalyst for cross-coupling reactions and energy storage applications. *Applied Surface Science*, 570, 15115666. doi: 10.1016/j.apsusc.2021. 151156. Impact factor: 6.707
19. Khatun, N., Sridurai, V., Gupta, R. K., Nath, S., Kanakala, M. B., Garain, S., Achalkumar, A. S., Yelamaggad, C. V., & Nair, G. G. (2021). Effect of Photonic Band Gap on Photoluminescence in a Dye-Doped Blue Phase Liquid Crystal. *The Journal of Physical Chemistry B*, 125, 11582-11590. doi: 10.1021/acs.jpcc.1c07422. Impact factor: 2.991
20. Khatun, N., Sridurai, V., Pujar, R., Kanakala, M. B., Choudhary, S. K., Kulkarni, G. U., Yelamaggad, C. V., & Nair, G. G. (2021). Enhanced thermal stability and monodomain growth in a 3D soft photonic crystal aided by graphene substrate. *Journal of Molecular Liquids*, 325, 115059. doi: 10.1016/j.molliq.2020.115059. Impact factor: 6.165
21. Krishnamurthy, K. S., Rao, D. S. S., Kanakala, M. B., & Yelamaggad, C. V. (2021). Electric response of topological dipoles in nematic colloids with twist-bend nematic droplets as the dispersed phase. *Physical Review E*, 103, 042701. doi:10.1103/PhysRevE.103.042701. Impact factor: 2.529
22. Kundu, S., George, S. J., & Kulkarni, G. U. (2021). Parts per billion sensitive, highly selective ambient operable, ammonia sensor with supramolecular nanofibres as active element. *Sensors and Actuators B-Chemical*, 347, 130634. doi: 10.1016/j.snb.2021.130634. Impact factor: 7.335
23. Lobo, K., Sahoo, P., Kurapati, R., Krishna, V. K., Patil, V., Pandit, A., & Matte, H.S.S.R. (2021). Additive free Aqueous Dispersions of Two-Dimensional Materials with Glial Cell Compatibility and Enzymatic Degradability. *Chemistry-a European Journal*, 27, 7434-7443. doi:10.1002/chem.20200549. Impact factor: 5.236
24. Makkaramkott, A., Mukherjee, R., Avasthi, S., & Angappane, S. (2021). Ambient Prepared Mesoporous Perovskite Solar Cells with Longer Stability. *Journal of Electronic Materials*, 50, 1535-1543. doi:10.1007/s11664-020-08721-71.93849. Impact factor: 1.938
25. Malani, S. B., & Viswanath, P. (2021). Wettability Contrast in the Hexagonally Patterned Gold Substrate of Distinct Morphologies for Enhanced Fog Harvesting. *Langmuir*, 37, 8281-8289. doi: 10.1021/acs.langmuir.1c01065. Impact factor: 4.331
26. Mandal, S., Gupta, R. K., Pathak, S. K., Rao, D. S. S., Prasad, S. K., Sudhakar, A. A., & Jana, C. K. (2021). Metal free C-H functionalization of pyrrolidine to pyrrolinium-based room temperature ionic liquid crystals. *New Journal of Chemistry*, 45, 8064-8071. doi:10.1039/d1nj00647a. Impact factor: 3.591

27. Mondal, I., Kiruthika, S., Ganesha, M. K., Baral, M., Kumar, A., Vimala, S., Madhuri, P. L.Nair, G. G.,Prasad,S. K., Singh, A. K., & Kulkarni, G. U. (2021). ITO-free large area PDLC smart windows: a cost-effective fabrication using spray coated SnO<sub>2</sub> on an invisible Al mesh. *Journal of Materials Chemistry A*, 9, 23157-23168. doi:10.1039/d1ta05820g. Impact factor: 12.732
28. Moolayadukkam, S., Vishwanathan, S., Jun, B., Lee, S. U., & Matte, H.S.S.R (2021). Unveiling the effect of the crystalline phases of iron oxyhydroxide for highly sensitive and selective detection of dopamine. *Dalton Transactions*, 50, 13497-13504. doi:10.1039/d1dt01672e. Impact factor: 4.39
29. Moun, M, Vasdev, A, Pujar, R., Madhuri, K. P, Mogera, U., John, N. S, Kulkarni, G. U, & Sheet, G (2021). Enhanced electrical transport through wrinkles in turbostratic graphene films. *Applied Physics Letters*, 119, 033102. doi: 10.1063/5.0056212. Impact factor: 3.971
30. Navalkal, V. P., Veerabhadraswamy, B. N., Chakraborty, S., Khened, S. M., Mathad, R. D., & Yelamaggad, C. V. (2021). Investigation of dielectric behavior of two different Schiff base ferroelectric liquid crystals. *Ferroelectrics*, 571, 85-95. doi:10.1080/00150193.2020.1853742. Impact factor: 0.69
31. Nayak, P., & Viswanath, P. (2021). UV photodetector based on self-affine Langmuir-Blodgett film of nickel octabutoxy phthalocyanine doped with stearic acid. *Optical Materials*, 122, 111807. doi: 10.1016/j.optmat.2021.111807. Impact factor: 10.050
32. Nayak, R. A., Veerabhadraswamy, B. N., Rao, D. S. S., Sudhakar, A. A., & Yelamaggad, C. V. (2021). Room-Temperature, Deep-Red/NIR-Emissive, C-3-Symmetric (n,π-conjugated) Columnar Liquid Crystals: C-3h-Tris(keto-hydrazone)s. *ACS Omega*, 6, 3291-3306. doi:10.1021/acsomega.0c05779. Impact factor: 4.312
33. Pathak, G., Hegde, R. S., Punjalkatte, S. S., Rujiralai, T., Hegde, G., & Prasad, V. (2021). Porous carbon nanoparticles dispersed nematic liquid crystal: influence of the particle size on electro-optical and dielectric parameters. *Liquid Crystals*, 49, 1223-1234. doi :10.1080/02678292.2021.1988740. Impact factor: 3.512
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# Patents

1. **Title:** Scalable and tunable synthesis of visible to near IR absorbing and emitting library of metal sulfides QDs  
**Inventors:** Bhagavatula L V Prasad & Abhijit Bera  
**Indian Patent Granted:** 384312

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2. **Title:** Atomically thin metal sheets from soluble metal thiolate precursors through simple inert-heating technique  
**Inventors:** Bhagavatula L V Prasad & Balanagulu Busupalli  
**Indian Patent Granted:** 357638

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3. **Title:** Photoactive gel exhibiting optical memory states  
**Inventors:** : Vimala S., Geetha G. Nair, S. Krishna Prasad, Sathya S & C. V. Yelamaggad  
**Indian Patent Granted:** 357118

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4. **Title:** Cholesteric liquid crystals and device thereof  
**Inventors:** Veena Prasad, Nagaveni N.G., Gurumurthy Hegde & Rekha S. Hegde  
**Patent Granted:** 377272

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5. **Title:** Polymer stabilized liquid crystal device, composition and method thereof  
**Inventors:** S. Krishna Prasad, Marlin Baral and S.N. Jaisankar  
**Indian Patent Granted:** 380295

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6. **Title:** Photoactive gel exhibiting optical memory states  
**Inventors:** Vimala S., Geetha G. Nair, S. Krishna Prasad, Sathya S., C. V. Yelamaggad  
**Indian Patent Granted:** 357118

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7. **Title:** A Visibility Controlling device  
**Inventors:** G. U. Kulkarni, Ashutosh K. Singh & Rahul M.  
**Patent (Filed) Application Number:** CN112789549A

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8. **Title:** Inexpensive, Industrially Viable Luminescent 2D-Coordination Polymers [C.O.P.s] for Sensing High Energy Materials [H.E.M.s]  
**Inventors:** Sachin A Bhat & C. V. Yelamaggad  
**Patent (Filed) Application Number:** IN202031018271

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9. **Title:** Antimicrobial nanoformulation and synthesis method thereof  
**Inventors:** Neena Susan John & Ramya Prabhu B.  
**Patent (Filed) Application Number:** IN202141025077

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10. **Title:** A method for fabrication of liquid crystal device with unidirectional alignment of liquid crystals  
**Inventors:** S. Krishna Prasad, H.S.S. Ramakrishna Matte, D.S. Shankar Rao, Gayathri. R. Pisharody & Priyabrata Sahoo  
**Patent (Filed) Application Number:** IN202141029054

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11. **Title:** Passive radiative cooling system and preparation thereof  
**Inventors:** Geetha G Nair Geetha G Nair, H S S R Matte & Amit Bhardwaj  
**Patent (Filed) Application Number:** IN202141031113

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12. **Title:** Lanthanide metal-based Coordination polymers and methods thereof  
**Inventors:** Kavita Pandey, Manmohansingh Waldiya, Madhu B Kanakala, Sabiar Rahaman & C. V. Yelamaggad  
**Patent (Filed) Application Number:** IN202241019317

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13. **Title:** Synergistic composition of a liquid crystal mixture exhibiting wide temperature range of Blue Phase III and method thereof  
**Inventors:** Nurjahan Khatun & Geetha G. Nair  
**Patent (Filed) Application Number:** IN202241013809

## Other events

CeNS celebrated and conducted various events to spread comprehensive knowledge and awareness which are essential to build a strong community. Several events were organized to commemorate the 75<sup>th</sup> anniversary of India's Independence – Azadi Ka Amrit Mahotsav (AKAM).



To re-create an endearing tradition of yesteryears, a culinary contest named Kai-Tuttu was conducted on 29 April 2022



As part of the International Women's Day celebrations, the Centre felicitated Dr. Geetha G. Nair for her career achievements and contributions to science on 1 April 2022.



CeNS arranged Handloom sale cum Exhibition in association with DESI trusts on 20 April 2022. CeNSians actively participated in the exhibition.



CeNS in association with the Indian Red Cross Society and Rotary Club, Cubbon Park, Bengaluru, organized a Blood Donation camp on 2 December 2021.



A Special Lecture on the occasion of World Mental Health Day was organized at CeNS on October 25, 2021.



The 'Kala Fiesta,' was held on 18 August 2021 at Nabhangana including marvellous Rabindra Nritya and a Malayalam ghazal. The students performed an intense piece that was dedicated to the brave warriors of the Indian armed forces.







## नैनो एवं मृदु पदार्थ विज्ञान केंद्र

विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार के अधीन एक स्वायत्त संस्था

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