Workshop on

Advances in Nanotechnology: Fabrication, Processing and Applications

28th February – 1st March 2014

Book of Abstracts

Centre for Nanoscience and Nanotechnology

School of Physics

Bharathidasan University

Tiruchirappalli – 620 024.

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Workshop on

Advances in Nanotechnology: Fabrication, Processing and Applications

(28th February – 1st March, 2014)

Convener

Dr. K. Jeganathan

Associate Professor & Coordinator

Centre for Nanoscience and Nanotechnology

School of Physics

Bharathidasan University

Tiruchirappalli – 620 024.

About the Workshop

This workshop is being organized by the Centre for Nanoscience and Nanotechnology, School of Physics, Bharathidasan University, Tiruchirappalli which covers the topics on Advances in Nanotechnology: Fabrication, Processing and Applications to the benefit of the students of interdisciplinary. Eminent speakers from reputed institutions namely central institutes and universities are delivering invited talks focusing the above theme of the workshop. The Young Faculties, Research scholars and PG students of physics, chemistry, materials science, life sciences and nanotechnology are encouraged to utilize this opportunity.

Topics to be discussed

- **Physics and Chemistry of Nanomaterials**
- **Synthesis, Processing and Applications**
- **Nanomedicine: Drug Delivery and Cancer Therapy**

Dr. K. Jeganathan
Associate Professor & Coordinator,
Centre for Nanoscience and Nanotechnology,
School of Physics,
Bharathidasan University,
Tiruchirappalli-620 024.

Biography of the convener: Dr. K. Jeganathan has received his Ph.D degree from Anna University, Chennai in 1999. After that, he was awarded **Science and Technology Agency** (STA) Fellowship, Govt. of Japan (2000-2002) to work on III-Nitrides by rf-MBE at AIST, Tsukuba, Japan and then continued to work in the same laboratory as a AIST researcher (Tenure Track) for developing AlGaN and InAlN based HEMT structure on SiC substrates by MBE until 2006. In 2006, he relocated to Forsungcentrum, Juelich, Germany as **Alexander von Humboldt fellow** to develop self-assembled III-nitride nanowires on Silicon substrates by MBE. In Sep.2007, he has been appointed as **Associate Professor** at School of Physics, Bharathidasan University, Tiruchirappalli. He has developed the state of art of experimental facilities for the fabrication, processing and characterisation of one-dimensional GaN nanostructures. His current research interest include fabrication and characterisation of GaN and InGaN nanowires for LEDs, FETs, gas sensor and photocatalyst; Epitaxial Graphene, graphene-metal oxide composites, p-GaN/ZnO Hybrid NW LED, photothermia using functionalized metal nanorods utilizing SPR effect and drug delivery. He (co) authored 79 peer reviewed regular articles. He is operating sponsored research projects worth of INR ~ 5 crore for the development of 1D nitride semiconductor nanostructures.

National Advisory Committee

Prof. J. Kumar, Anna University, Chennai.
Prof. V. Ramakrishnan, Madurai Kamaraj University, Madurai.
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Dr. R. Ilangovan, Alagappa University, Karaikudi.
Dr. N. Gopalakrishnan, NIT, Tiruchirappalli.
Dr. R. Ramesh Babu, Bharathidasan University, Tiruchirappalli.
Dr. K. Premkumar, Bharathidasan University, Tiruchirappalli.
Dr. K. Jothivenkatachalam, Anna University, BIT, Tiruchirappalli.
Dr. T. C. Sabari Girisun, Bharathidasan University, Tiruchirappalli.
Dr. M. Senthil Kumar, NPL, New Delhi.

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Workshop on "**Advances in Nanotechnology: Fabrication, Processing and Applications**"

(28th February – 1st March, 2014)

Centre for Nanoscience and Nanotechnology
School of Physics
Bharathidasan University
Tiruchirappalli – 620 024.

Programme Schedule

Day-1: 28th February 2014	
Time	**Event Details**
09.30–10.30 A.M.	Registration
10.30–11.30 A.M.	Inauguration
11.30–11.45 A.M.	High Tea
Session: 1 Special Lecture – National Science Day 2014	
11.45-01.00 P.M.	"***Biomedical Applications of Raman Spectroscopy and Imaging***" **Prof. R. Murugesan**, Chettinad University, Kelambakkam, Chennai-603103.
01.00-02.00 P.M.	Lunch Break
Session: 2	
02.00-03.00 P.M.	"***Organic-inorganic hybrids: Synthesis and their Multifaceted applications***" **Dr. M. Eswaramoorthy**, JNCASR, Bangalore-560064.
03.00-04.00 P.M.	"***Self-assembly of Nanomaterials for different applications***" **Dr. M. Sivakumar**, BIT Campus, Anna University, Tiruchirappalli-620024
04.00-04.15 P.M.	Tea Break
04.15-05.15 P.M.	"***Nanomedicine: A new hope for old obstacles***" **Dr. K. Premkumar**, Bharathidasan University, Tirchirappalli-620024.

Workshop on "**Advances in Nanotechnology: Fabrication, Processing and Applications**"

(28th February – 1st March, 2014)

Centre for Nanoscience and Nanotechnology
School of Physics
Bharathidasan University
Tiruchirappalli – 620 024.

Programme Schedule

Day-2: 1st March 2014	
Time	**Event Details**
Session: 3	
10.00-11.00 P.M.	"***Carbon nanotubes interaction with cells: Implications on the biomedical applications***" **Dr. R. T. Rajendrakumar**, Bharathiar University, Coimbatore-641046.
11.00-12.00 Noon	**"*Recent advances in nano-biomaterials for biosensors*"** **Dr. N. Meenakshi Sundaram,** PSG College of Technology, Coimbatore-641004.
12.00-12.15 P.M.	Tea Break
12.15-01.15 P.M.	**Laboratory Visit**
01.15-02.00 P.M.	Lunch Break
Session: 4	
02.00-03.00 P.M.	**Poster Session**
03.00-04.00 P.M.	**"*Fabrication of MFIS capacitors for the non-volatile memory applications and some gas sensors*"** **Dr. R. Ilangovan**, Alagappa University, Karaikudi-630003.
04.00-04.15 P.M.	Tea Break
04.15-04.30 P.M.	Valedictory function

Abstract and Profile of the invited speakers

Prof. R. Murugesan
Director,
Faculty of Allied Health Sciences,
Chettinad University,
Kelambakkam,
Chennai-603 103.

Biography of the speaker: Prof. R. Murugesan is the Director of Faculty of Allied Health Sciences, Chettinad Academy of Research & Education, Chennai.

- B.Sc Gold Medalist, St. Xavier's College, Palayamkottai, 1969.
- M.Sc University first rank, Bagthavathchalam memorial prize, Madurai Kamaraj University, 1971.
- National trainee award, National Biomedical ESR Center, Milwaukee, Wisconsin, USA, 1984.
- Visiting Scientist, National Cancer Institute, USA 2001.
- Visiting Professor, Kyushu University, Dec 2005 -Feb 2006.
- Member, Expert Committee, Commonwealth Academic Staff Fellowship selection for the year 2005, University Grants Commission, New Delhi, December 2004.
- Member, Expert Committee, Evaluation and Research Funding Council – Major and Minor Research Projects, University Grants Commission, New Delhi, August 2004.
- Member, Expert Committee, Evaluation and Research Funding Council – Major and minor research projects, University Grants Commission, New Delhi, July 2005.

Biomedical Applications of Raman Spectroscopy and Imaging

Prof. R. Murugesan
Faculty of Allied Health Sciences,
Chettinad University,
Kelambakkam, Chennai-603 103.

Abstract

Traditionally, Raman spectroscopy is widely used as an excellent analytical tool for molecular structure determination. With the advent of lasers for excitation, potential of Raman spectroscopy to interrogate various biomedical processes, such as the analysis of cells in culture, excised tissue samples, and preclinical animal models has been exploited. During the last few years attempts are made to use Raman spectroscopy for clinical diagnosis by interrogating the intrinsic differences in the molecular signatures of normal and pathogenic status. However, long exposure times, limited depth of penetration, background fluorescence and less than adequate sensitivity for probing the subtle changes associated with the early-stage disease conditions, severely limit translation of Raman spectroscopy into the clinic. This presentation will provide an overview of biomedical applications of Raman spectroscopy and imaging, highlighting the potentials as well as challenges and limitations. It will further outline the recent developments in micro-Raman, nano-Raman and tip-enhanced SERS Raman techniques and in the fabrication of highly sensitive Raman probes to provide real-time, quantitative diagnostic information *in vivo*. Strategies to develop tumor-targeting nanoprobes to target tumor markers better to improve early diagnosis during endoscopic, laparoscopic, or surgical procedures, as well as obtaining important molecular information for prognosis will also be presented.

Dr. M. Eswaramoorthy
Associate Professor,
Chemistry and Physics of Materials Unit,
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR),
Bangalore- 560 064.

Biography of the speaker: **Dr. M. Eswaramoorthy** has received his Ph.D degree from Anna University, Chennai in 1996. After that he has carried out his post doctoral research work in Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore (1996-1999) and then he was relocated to National Institute of Materials and Chemical Research Tsukuba, Japan as Science and Technology Agency (STA) Fellow (1999-2001). In the year of 2001, he moved to Department of Inorganic and Materials Chemistry, Bristol University, UK as a post doctoral fellow (2001-2003). During the year (2003-2004), he was awarded AIST research fellowship to work in Membrane laboratory, Tohoku National Institute, Japan. In the year 2004, he has been appointed as a faculty in Chemistry and Physics of Materials Unit, Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore. Now, his research group focuses on the following areas; Morphogenesis, Intracellular drug delivery, nanocomposites, and Porous materials and catalysis. He has published several research articles in high impact factor journals such as Science, ACS Nano, Angewandte Chemie International Edition and etc.

Organic-inorganic hybrids: Synthesis and their Multifaceted applications

Dr. M. Eswaramoorthy
Associate Professor, Chemistry and Physics of Materials Unit, JNCASR, Bangalore- 560 064.

Abstract

The synthesis and applications clay based organic-inorganic hybrids will be discussed in this talk. The introduction of covalently linked amino pendants within the clay aids its nanoscale dispersion in water. This property has been effectively utilized to make water dispersible clay-polyelectrolyte, clay-RGO and clay-dye hybrids. Furthermore, the application of these organic-inorganic hybrids in catalysis, drug delivery, light harvesting and biomolecules adsorption will be discussed.

1. C. Piyush, J. Dinesh and M. Eswaramoorthy, pH sensitive breathing of clay within the polyelectrolyte matrix, ACS Nano, 4, 5921 - 5929 (2010).
2. K. V. Rao, K. K. R. Datta, M. Eswaramoorthy and S. J. George, Light-Harvesting Hybrid Hydrogels: Energy Transfer Induced Amplified Fluorescence in Non-Covalently Assembled Chromophore-Organoclay Composites, Angew. Chem. Int. Ed., 50, 1179 - 1184 (2011)
3. A. Achari, K. K. R. Datta, M. De, V. P. Dravid and M. Eswaramoorthy, Amphiphilic aminoclay-RGO hybrids: A simple strategy to disperse high concentration of RGO in water , Nanoscale, 5, 5316 - 5320 (2013).

Dr. M. Sivakumar
Visiting Professor & Coordinator
Nanoscience and Technology Program
Bharathidasan Institute of Technology
Anna University,
Tiruchirappalli-620 024.

Biography of the speaker: **Dr. M. Sivakumar** has completed his Ph.D degree from Anna University, Chennai in the year of 1998. He has spent 9 years as postdoctoral fellow in different universities such as National University of Singapore and Nagoya Institute of Technology, Japan. He is a recipient of internationally competitive fellowship called JSPS from Japan. Later, he has joined Anna University-Bharathidasan Institute of Technology, Tiruchirappalli as Visiting Professor and heading the Nanoscience and Technology program. He has published more than 45 papers in reputed journals, filed one Indian patent and has attended 75 international and national conferences. He has delivered about 50 international and national level invited talks in different countries, Japan, Canada and Singapore. He has acquired several lakh rupees research funding from CSIR and DBT for the present research activities. He has 646 citations and h-index is 15. He is founder coordinator for M. Tech Nanoscience and Technology program in Anna University BIT Campus, Tiruchirappalli.

Self-assembly of Nanomaterials for different applications

Dr. M. Sivakumar
Bharathidasan Institute of Technology
Anna University, Tiruchirappalli-620 024.

Abstract

The spontaneous arrangements of tiny materials or blocks in an arranged manner are universally available in nature. Starting from the order of nucleic acids, peptides, proteins, entire human body, all are self assembled structures only. Assembling of tiny building blocks to form the super structures by themselves is known as self assembling. Various materials can be assembled and eventually evolve into different nanostructures for diverse applications through respective assembling routes. Processes ranging from the non-covalent bonding of organic molecules in solution to the growth of semiconductor quantum dots on solid substrates have been called self-assembly. The self assembling method has been well suited for several applications in nano-scale industries and this method found to be a solution for several problems. Our recent research on biosensors focused on the development of nanomaterials. The simple concept of self-assembly is influenced by several factors such as refractive index of the nanomaterials, the nano ordered film thickness, number of layers and light.

Dr. K. Premkumar
Assistant Professor,
Department of Biomedical Science,
Bharathidasan University,
Tiruchirappalli – 620 024.

Biography of the speaker: **Dr. K. Premkumar** has received his Ph.D degree from University of Madras, Chennai in 2002. After that, he has carried out his Post Doctoral Research work in Department of Internal Medicine and Radiation Oncology, University of California, Davis. USA (2002-2005) and then he was relocated to Center for Pharmacogenetics Department of Pharmaceutical Sciences, University of Pittsburgh, Pittsburgh, PA 15261 USA as a Research Associate (2005-2006). In year of 2006, he has been appointed as Assistant Professor, Department of Biomedical Science, Bharathidasan University, Tiruchirappalli-62024, Tamilnadu, India.

Area of Research Interest:

Molecular Cytogenetics, Cancer biology, Nanomedicine & Nanotoxicology

Publications: 32 Publications in international Journals
2 Book Chapters

Research Projects: 5 (DST, UGC, DBT & ICMR) Value of 1.8 crores

Awards, Patents, Prizes etc.,

2009 DST Young scientist award 2009

2013 INSA Visiting Fellowship

Professional Memberships

1. Environmental Mutagen Society of India (EMSI) – Life member.
2. International Association for Biomedical Sciences (IABMS) - Life member.
3. Indian Society of Human Genetics (ISHG) - Life Member.

Nanomedicine: A new hope for old obstacles

Dr. K. Premkumar
Department of Biomedical Science, Bharathidasan University, Tiruchirappalli – 620 024.

Abstract

Nanomedicine has recognized as an emerging area of science, which exploits the novel physical, chemical, and biological properties of materials at the nanometric scale. The "3D principle'' (Diagnosis, Detection, Drug delivery) of nanomedicine has potential impact on the prevention, early and reliable diagnosis and treatment of previously un-curable diseases. Nanomedicine recognised as a new emerging area of science, which includes functionalization with groups that recognize and kill cancer cells, and may hope for multifunctional "smart" therapeutics. Diagnostics, targeted delivery and regenerative medicine constitute the core disciplines of Nanomedicine. Nanotechnology will enable diagnostic devices and therapeutics to be combined for a real benefit to patients. Although, biomedical application of nanoparticles has experienced an exponential growth in the past few years, this technology has proven rather more challenging in execution. Many researchers are now beginning to raise question towards this technology due to the unresolved issues with the design, delivery and toxicity. To overcome these obstacles, we therefore need to understand the relevant physical and chemical variations to make progress in this area. Furthermore we need to understand the mechanism, efficacy and toxicity of utilizing these Nanomaterials for various applications in the field of medicine, which in turns leading to novel therapeutic approaches. My talk presents an overview of the possible applications of nanomaterials in medicine, highlighting its utilization as far as therapeutic and diagnosis is concerned. In addition long-term fate and toxicity concerns of nanoparticles will also be discussed.

Dr. R. T. Rajendrakumar
Associate Professor,
Department of Nanoscience and Technology,
Bharathiar University,
Coimbatore - 641 046.

Biography of the speaker: **Dr. R. T. Rajendrakumar** has received his Ph.D in Physics from Bharathiar University, Coimbatore in 2003. He has been working in the area of micro/nanofabrication, metal oxide and carbon based nanomaterials for photocatalysis and sensing applications. During 2003 to 2008, he has worked as Post Doctoral Research Scientist at Stockholm University, Sweden; Dublin City University, Ireland and Technical University of Denmark, Denmark. He has joined in Bharathiar University as a Reader in 2009 and currently working as an Associate Professor in Nanoscience and Technology. Since 2013, he is also working as Joint Director in DRDO-BU Center for Life Science, Bharathiar University. He has published more than 45 research articles and two book chapters in the area of Nanotechnology. He is a member of Magnetic Society of India, Institute of Physics, UK.

Carbon nanotubes interaction with cells: Implications on the biomedical applications

Dr. R. T. Rajendrakumar
Department of Nanoscience and Technology, Bharathiar University, Coimbatore 641 046.

Abstract

Carbon nanotubes (CNTs) are allotropes of carbon. CNTs possess cylindrical shape with the diameters in the nanoscale and the length range from few microns to centimetres have peculiar properties that make them potential for many applications in Nanotechnology, environmental monitoring, electronics, optics and energy harvesting and other fields of materials science. They are very robust to chemical attack and exhibit superior mechanical and electrical properties. First part of the lecture deals with the brief history about CNTs followed by touching up few important synthesis methods and techniques to yield controlled and large scale growth of CNTs. Further, a brief account of emerging devices based on applications of CNTs not limited to sensors, high speed electronics, energy harvesting and storage applications are presented. The other part of the lecture will cover the biomedical aspects of both Single walled and Multiwalled Carbon nanotubes. Focusing on the CNT interactions with bacterial cells, the role of CNTs on the cell damage and the mode of cell damage will be elaborated. Further, actual mechanism behind bactericidal action of CNTs will be explored. This understanding could be interesting for novel biomedical applications.

1. C. Yang, J. Mamouni, Y. Tang, L. Yang, Langmuir, 2010, 26, 16013.
2. K. Rajavel, R. Gomathi, S.Manian, R. T. Rajendrakumar, Langmuir, 2014, 30,592.

Dr. N. Meenakshi Sundaram
Associate Professor,
Department of Biomedical Engineering,
PSG College of Technology,
Coimbatore 641 004.

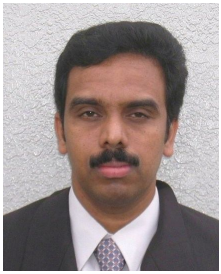
Biography of the speaker: **Dr. N. Meenakshi Sundaram** has carried out his pre-doctoral research work at The Institute of Molecular Biotechnology, Jena, Germany during the year 2002 to study on Crystallo-genesis of Proteins for structural Biology. He has completed his PhD degree in the field of nanobiomaterials at Crystal Growth Centre, Anna University, Chennai-600025 during the year 2005. He is the recipient of DST BOYSCAST award to carry out his post doctoral research at The University of Oklahoma, USA during the period 2008-09 for developing nanoscale materials and fibre as bone tissue engineering. He has been published more than 15 research articles in internationally renowned and peer reviewed research journals with a total impact factor of 35. He is the Principal investigator of two major research projects with a total tune of Rs.36 lakhs funded by DST and UGC. His current research interest is on "Design and development of Nanoscale biosensors for cholesterol and glucose detection" which is supported by UGC and "To design and development of nanoscale biocompatible materials and devices for biomedical applications" which is supported by DST, New Delhi. Now, he is going to give an Overview and recent progress in technology and development of biomedical materials devices for the detection of Cholesterol and related biomolecules.

Recent advances in nano-biomaterials for biosensors

Dr. N. Meenakshi Sundaram
Department of Biomedical Engineering, PSG College of Technology, Coimbatore 641 004.

Abstract

Nanoscale biosensors have recently gained much attention in the field of health care for the management of various important analytes in a biological system. The area achieved tremendous progress from the time when the first Clark electrode for measurement of glucose was realized. Advances in the biosensor design are appearing at a high rate as these devices play increasingly important roles in our daily lives. The increasing incidences of cardiovascular diseases and cardiac arrest are major cause of death of humans world over. One of the most important reasons is hypercholesterolemia, i.e. increased concentration of cholesterol in blood. Hence estimation of cholesterol level in blood is important in clinical applications. This presentation aims to highlight the recent advances in nanomaterials and techniques for cholesterol biosensor design and construction.



Dr. R. Ilangovan
Assistant Professor,
Department of Nanoscience and Technology,
Alagappa University,
Karaikudi-630 003.

Biography of the speaker:

Experience:

Research experience : 19 Years

Post-Doctoral experience : 3 Years

Research Interests:

i) Growth and characterization of ferroelectric single crystals & thin films

ii) Growth and characterization of laser crystals.

ii) Fabrication of electronic device such as FeRAM, DRAM and Flash memory

Awards and Recognition:

i. Young Researcher award (IUMRS conference, I. I. Sc, Bangalore, India 1998).
ii. Young Scientist Award (ICCG-13 conference, Doshisha University, Kyoto, Japan 2001)
iii. Science & Technology Agency (STA) Fellowship, Japan (2001-2003) through Department of Science and Technology (DST), New Delhi, India.

Fabrication of MFIS capacitors for the non-volatile memory

Dr. R. Ilangovan
Department of Nanoscience and Technology,
Alagappa University, Karaikudi-630 003.

Abstract

Nanoscale biosensors have recently gained much attention in the field of health care for the management of various important analytes in a biological system. The area achieved tremendous progress from the time when the first Clark electrode for measurement of glucose was realized. Advances in the biosensor design are appearing at a high rate as these devices play increasingly important roles in our daily lives. The increasing incidences of cardiovascular diseases and cardiac arrest are major cause of death of humans world over. One of the most important reasons is hypercholesterolemia, i.e. increased concentration of cholesterol in blood. Hence estimation of cholesterol level in blood is important in clinical applications. This presentation aims to highlight the recent advances in nanomaterials and techniques for cholesterol biosensor design and construction.

Abstracts

NSDP01	**Synthesis and characterization of iron oxide nanoparticles for antibiofilm activity**
	V. Ramalingam and R. Rajaram **DNA Barcoding and Marine Genomics lab, Department of Marine Science,** **Bharathidasan University, Tiruchirappalli – 620 024,** **Tamil Nadu, India.**

Biofilms cause up to 80% of infections and are difficult to treat due to their considerable multidrug resistance compared to their planktonic counterparts. The present study aims to synthesis the iron oxide nanoparticles (FeO-NPs) using grey mangrove *Avicennia marina* in biological manner. The nanostructures were characterized by UV-visible spectroscopy, Scanning electron microscope (SEM) for size, zeta potential for stability, X-ray diffraction (XRD) for structure and Fourier transform infrared spectroscopy (FTIR) for functional group analysis. The synthesized FeO-NPs inhibited the initial attachment and biofilm development of bacterial strains *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. Almost 72% of quorum sensing factors (QSF) of *P. aeruginosa* were impeded by 200µg/ml of FeO-NPs, 63% and 46% for *S. aureus* and *E. coli* respectively. The nanomaterials also decrease the cell surface hydrophobicity (CSH) of biofilm forming bacteria that leads the initial adhesion on solid and medical devices.

NSDP02	**Investigation of Antimicrobial and Synergistic activity of chemically synthesized gold nanoparticles**
	A. R. Arthi and P. Prema **Research Department of Zoology, Virudhunagar Hindu Nadars' Senthikumara Nadar College (Autonomous), Virudhunagar-626 001, Tamil Nadu, India.**

In the last few years the field of nanotechnology has received immense attention due to its vast applications. In this contribution, we report the synthesis of GNPs using trisodiumcitrate as a reducing agent. The color change from pale yellow to wine red of the synthesized gold nanoparticles was visually recorded. The UV-VIS absorption spectroscopy of the data revealed that the absorption was recorded at 537nm. FTIR spectrum revealed that the active functional groups in the synthesized nanoparticles showed the absorption band at 3400cm^{-1} is due to the hydroxyl (OH) stretching mode. The peak at 1543cm^{-1} is due to carbonile group and at 1319cm^{-1} can be assigned to carboxyl group. The absorption shows bands at 2924 and 2852 cm^{-1} pertaining to symmetrical and asymmetrical stretching of methylene groups. Crystalline nature of the gold nanoparticles were examined using XRD and high level peak of synthesized gold nanoparticle was observed at (111) Bragg reflections in the 2θ range. The morphology of the gold nanoparticle was measured using SEM analysis. The antibacterial activity of the GNPs was observed against few common human pathogens. Among the used human pathogens, *Bacillus cereus* showed the highest zone of inhibition (20mm). The synergistic effect of the gold nanoparticle was recorded using kanamycin as standard antibiotic and the fold increase was found to be 133.3%.

NSDP03	**Biosynthesis and characterization of gold nanoparticles using Klebsiella pneumoniae**
	P. Prema and P. Anandhainiya **Research Department of Zoology, Virudhunagar Hindu Nadars' Senthikumara Nadar College (Autonomous), Virudhunagar-626 001, Tamil Nadu, India.**

Nanotechnology is an emerging as one of the most important and revolutionizing area in research field. Biological methods for reduction of metal ions using plants or microorganisms are often preferred because they are clean, non – toxic, safe, biocompatible and environmentally acceptable. In the present study extracellular biosynthesis of gold nanoparticles was achieved using *Klebsiella pneumonia* as a reducing agent. Synthesized nanoparticle was confirmed by the color change from yellow to pinkish violet. The produced nanoparticles were then characterized by UV, Fourier Transform Infra Red Spectroscopy (FTIR), Scanning Electron Microscope (SEM), X Ray diffraction (XRD). Antibacterial activity of gold nanoparticles was done against human pathogens like *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus epidermis*, *Staphylococcus aureus*, and *Bacillus subtilis*. Among the selected human bacterial pathogens, *Escherichia coil* was showed highest inhibition zone (30mm).

NSDP04	**Biosynthesis of silver nanoparticle using *Pseudomonas aeruginosa*** ***P. Prema, N. Subashini, and P. Viji***
	Research Department of Zoology, Virudhunagar Hindu Nadars' Senthikumara Nadar College, (Autonomous), Virudhunagar-626001, Tamil Nadu, India.

The development of reliable eco friendly processes for the synthesis of nanoscale matrials is an important aspect of nanotechnology. The extra cellular synthesis of sliver nanoparticles by reduction of aqueous Ag^+ ions with the culture supernatant of *Pseudomonas aeruginosa.* It was found that aqueous Ag^+ ions in solution when exposed to *Pseudomonas aeruginosa* get reduced there by leading to the formation of sliver nanoparticles was confirmed by the change in the color of the culture filtrate from yellow to brown. Produced nanoparticles were characterized by UV, FTIR , XRD, SEM. These biosynthesized sliver nanoparticles were also evaluated for their antimicrobial activities against selected human pathogens. Based on this findings it is concluded that the sliver nanoparticles have unique diagnostics, therapies as well as potentially active against human bacterial pathogens like *Escherichia coli*, *Klebisella pneumoniae*, *Staphylococcus epidermis*, *Staphylococcus aureus*, and *Bacillus subtilis.* Among the selected human bacterial pathogens *Escherichia coli* was showed highest inhibition zone (25mm).

NSDP05	**Phenylalanine mediated silver nanoparticles in aqueous colloid and in sol-gel matrix**
	M. Nidya, and Beulah J. M. Rajkumar **P.G and Research Department of Physics, Lady Doak College, Madurai-625 002, Tamilnadu, India.**

Phenylalanine mediated silver nanoparticles were synthesized both in aqueous and sol-gel thin film. That nanoparticles have indeed been formed is confirmed by the UV/Visible spectrum. Different spectral profiles of the synthesized NPs in the aqueous and the sol gel media indicate different morphologies which have been confirmed by the Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM). The crystalline structure was confirmed from the XRD while the Surface Enhanced Raman Scattering (SERS) result reveals that phenylalanine is bound on the Ag surface via benzene moiety both in the aqueous media and in the sol gel film.

NSDP06	**Synthesis and characterization of SnO_2 nanospheres and its alcohol sensing**
	Imran Hussain. S[1], Baraneedharan. P[2], Muthusamy Sivakumar[2#] **[1]Nanoscience and Technology, Department of Physics, Bharathidasan Institute of Technology, Anna University, Tiruchirappalli-620 024** **[2]Department of Chemistry, Bharathidasan Institute of Technology, Anna University, Tiruchirappalli-620 024.**

[#]Corresponding author: muthusiva@gmail.com

Tin Oxide (SnO_2) nanospheres were synthesized by one step hydrothermal reaction of $SnCl_2$ with HCl /Ethanol solvent mixture in surfactant free environment. The absorption spectrum shows absorption peak at 317 nm suggesting the possibility of smaller size. The characteristic vibrations of Sn-O-Sn bonds in SnO_2 were analyzed using FT-IR spectrum. Diffraction analysis and Raman Spectra confirmed that the particles correspond to tetragonal system of SnO_2 with higher degree of crystalline nature and purity. The morphology of prepared nanospheres was characterized using FE-SEM and the average size ranges from 100 to 150 nm. The response and recovery of SnO_2 nanospheres towards ethanol were carried out and the SnO_2 nanospheres exhibit a high sensitivity.

NSDP07	**Antibacterial and Antibiofilm potential of Green Synthesis of zinc oxide nanoparticles**
	Vijayakumar.S, Malaikozhundan. B and Vaseeharan. B **Department of Animal Health & Management, Alagappa University, Science Campus 4th Floor, Burma Colony, Karaikudi – 630 004, TamilNadu, India.**

The synthesis of plant based nanoparticles is of greater importance in the field of research to combat several problems including treatment of diseases, development of anti-malarial and anti- bacterial drugs. In the present study, *Plectranthus amboinicus* based ZnO nanoparticles were synthesized and characterized using SEM, TEM, FTIR, XRD and UV-visible spectroscopy. The results revealed that average size of the particle was 10-50nm. XRD spectra showed strong diffraction peaks at 31, 34, 36, 47, 56, 62, 66, 67 and 68 degrees of 20 which corresponds to (100), (002), (101), (102), (110), (103), (200), (112) and (201) crystal planes, which were in significant agreement with the JCPDS file 36145 (a = b = 3.249 Å, c = 5.206 Å) and indexed as the hexagonal wurtzite structure of ZnO NPs having space group P63 mc. FTIR spectra showed the occurrence of three bands at 3439 cm^{-1}, 2924 cm^{-1} and 2853 cm^{-1}. The antimicrobial activity of green synthesized ZnO nanoparticles at different concentrations (2, 4, 6 4, 8, 12 µg/mL) were tested against *Staphylococcus aureus* by the well diffusion method. ZnO Nps showed maximum degree of inhibition and particularly 14–16 mm showed extended activity against *Staphylococcus aureus*. The antibiofilm activity of ZnO nanoparticles were studied through Confocal Laser Scanning Microscopy and it elucidated the strong antibiofilm potential of ZnO nanoparticles against *S. aureus* upon treatment with 4µg/ mL of ZnO. Based on the results of this study, ZnO nanoparticles may be used as anti-bacterial agents against potential bacterial pathogens.

NSDP08	**Microwave assisted synthesis of Cobalt doped on SnO_2 nanoparticles**
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$Sn_{1-x}Co_xO_2$ nanoparticles have been successfully synthesized by a facile route involving the reaction of microwave irradiation. Dopant concentration played a vital role and lead to the formation of nanoparticles of different size ranging from 9 to 21 nm and varying morphological shape ranging from nanocubes to irregular shape. The FTIR spectrum confirms the formation of SnO_2 nanoparticles. The X-Ray Diffraction patterns reveals that all the samples correspond to tetragonal system of SnO_2 with higher angle peak shift of varied intensity for Co^{2+} incorporated SnO_2 nanoparticles. Further, the changes in Raman spectrum were analyzed with varying concentration which confirms the phase purity with no dominant impurities. The oxygen vacancies induced defects that have been introduced during growth process results in visible emission along the near-band edge emission in $Sn_{1-x}Co_xO_2$ nanoparticles. The room temperature ferromagnetism is confirmed by magnetization hysteresis measurements and the value of magnetic moment is sensitive to their size and dopant concentrations.

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NSDP09	**Zinc Oxide Nanopillar: Synthesis, Characterization and its Photoelectrocatalytic activity**
	K. Rokesh and K. Jothivenkatachalam [*] **Department of Chemistry, Anna University - BIT Campus, Tiruchirappalli – 620024.**

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Zinc oxide (ZnO) nanopillar was synthesized via a simple and cost-effective wet chemical method with the aid of ammonia. The morphology evolution of the ZnO nanostructures was studied using SEM analysis by changing ratio of Zn^{2+} and NH_4^+. The X-ray diffraction and photoluminescence measurements reveal the crystal quality and optical properties which depend on the morphology of the ZnO nanostructures. The photoelectrocatalytic activity ZnO nanopillar was investigated towards the oxidation of oxalic acid as a model compound. The newly prepared ZnO nanopillar has been observed to have a great potential in the progress of nanoscale applications.

NSDP10	**Biological synthesis and characterisation of nanoselenium**
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Dietary selenium supplementation in the poultry has been regularly practiced using the inorganic and organic forms. These forms have the limitations of having narrow margin of safety and non specific binding to tissue proteins, hence nano selenium having greater potential as poultry and livestock feed supplement with higher bioavailability, higher margin of safety and seven fold lower acute toxicity can be used as an alternate form was prepared using probiotic *Streptococcus* bacteria.. The synthesis of nanoselenium using the probiotic bacteria serves as green facile ecofriendly method as compared to the hazardous chemical and physical methods which employ high temperatures and pressures and expensive chemicals. *Streptococcus thermophillus* (strain –NCDC 74) culture was procured from National Dairy Research Institute, Karnal. Sodium selenite (20 mg) and fresh culture of *Streptococcus thermophillus* (10 ml) were mixed in 20 ml of distilled water and 980 ml of MRS broth was added to the contents. The red nanoselenium obtained after incubation for 48 h at 41°C was centrifuged at 14,000 rpm for 15 min, dried at 70 °C and stored in sealed tubes for further use. The particle size of yielded nanoselenium as determined by transmission electron microscopy was found in the range of 10-30 nm. The X ray diffraction peaks of the nanoselenium corresponded to that of selenium, confirming the purity of nanoselenium. Further the UV spectrogram peaks were within 280-353 nm indicating that the nanoparticles had size below 100 nm. Thus nanoselenium particles of size 10-30 nm could be produced using a simple biological method employing probiotic *Streptococcus thermophillus* bacteria. This form of selenium can be effectively used as a better selenium supplemental source to poultry and livestock with higher bioavailabilty and low toxicity.

NSDP11	**Synthesis and characterization of nanocrystaline indium nitride**
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III-V nitride semiconductors have attracted much research attention for their applications in electrical and opto-electronic field. Among these nitride, Indium nitride (InN) is widely employed in tuning the wavelength in the visible region. Synthesis of nano crystalline InN was done via sol-gel and ammonolysis method. The nitride is prepared in successive process: (i) producing their elemental–citrate-amine crystals by involving their nitrates in modified citrate method with optimization of pH 2 -3 (ii) Drying in air at 573 K (iii) subjected to ammonolysis at elevated temperatures. Experiments of nitridation process have been carried out under different temperatures in a horizontal reactor by varying the ammonia flow rate and for different growth periods. The period of nitration process has been found to have an important role in the formation of Indium nitride. Structural studies of X-ray diffraction (XRD) showed the formation of hexagonal InN. The optical properties of the synthesized nitride have been analyzed using diffusive reflectance spectra photoluminescence studies. Different morphological shapes of these agglomerated nitride have been using observed in the scanning electron microscope. Nano rods observed using the transmission electron microscope will also be presented.

NSDP12	**Structural and optical properties of Lithium doped ZnO nanostructures**
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ZnO nanostructures doped with lithium have been synthesized by hydrothermal method to obtain p-type ZnO and its effect on the morphology of ZnO is investigated. Zinc acetate dehydrate is reduced with sodium hydroxide (NaOH) using PEG (Poly Ethylene Glycol) as a structural directing agent. Optical properties have been analyzed by UV-Vis spectroscopy and Photoluminescence spectroscopy. Optical absorption peak at 370 nm confirms the formation of ZnO nanostructure and optical band bap was evaluated as 3.3 eV. From XRD data it is observed that full width at half maximum (FWHM) decreases while doping with Li. This indicates the better crystalline Li-doped ZnO in comparison with undoped nanostructures. PL analysis shows that the emission band at ultra violet region. The stretching vibrations of ZnO nanostructures have been analyzed by using Fourier Transform Infrared spectroscopy. Morphological characteristics have been analyzed by SEM.

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NSDP13	**Formulation and Evaluation of Aceclofenac Nanoemulsion Delivery System**
	S. Lakshmana Prabu, S.P. Sharavanan, A. Shanmugarathinam, K.Sathya*
	Department of Pharmaceutical Technology, Anna University, Bharathidasan Institute of Technology Campus, Tiruchirappalli – 620 024.

The aim of the present study was to formulate Aceclofenac nanoemulsion and to evaluate for enhanced topical and transdermal delivery for the treatment of rheumatoid arthritis. Nanoemulsion is defined to be thermodynamically or kinetically stable liquid dispersion of oil, surfactant and water in the range of 5 nm to 200nm. Drug in the nanoemulsion dosage form provides better absorption, bioavailability, rapid onset of action and lesser side effects. Aceclofenac nanoemulsion was prepared by spontaneous emulsification method followed by solvent evaporation method. The optimized nanoemulsion formulation contains Aceclofenac, Isopropyl Myristate, Span80, Methanol, Ethanol, Tween80 and Water. The formulations were tested for Microscopic observation (TEM), Droplet size measurement, transparency studies, pH and Viscosity measurement, Drug loading efficiency. Further, *In vitro* Evaluation like Drug content and drug release study was carried out. The FTIR studies reveal that the Drug and excipients in the formulation were found to be compatible and there was no chemical interaction between them. The average globule size and zeta potential are 17.51nm and 0.179 respectively. The in-vitro release of aceclofenac from nanoemulsion was found to be 51% at 30 min and 102% at 5 hr. On Conclusion, the obtained results were found to be satisfactory. Further on evaluation of the nanoemulsion for in-vivo studies the formulation may be useful in the efficient topical delivery of Rheumatoid Arthritis. The developed technology for the preparation of Nanoemulsion may also be a promising delivery system to improve the absorption and bioavailability of other hydrophobic drugs.

NSDP14	**Dip Coating of CdTe thin films on P-type silicon and porous silicon (100)**
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	P.G. and research center of Physics, Virudhunagar Hindu Nadars' Senthikumara Nadar College (Autonomous), Virudhunagar- 626001, Tamilnadu, India.

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The substrate variation on the surface morphology and electrical properties of Cadmium Telluride (CdTe) thin films were deposited on silicon and porous silicon substrates using the dip coating technique. The Cadmium acetate and Tellurium was used as a starting material. Characterization was done using X-Ray Diffraction (XRD), scanning electron microscopy (SEM), Photoluminescence (PL) and current-voltage (I-V) measurement. The result indicated that the structural, surface, optical and electrical properties of the CdTe thin films were changed with the changing of substrate.

NSDP15	**Preparation and Characterization of Iron Oxide Thin Films By Sol gel Dip Coating Method**
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The magnetite iron oxide thin films were deposited on three different substrates such as glass, silicon wafer, and porous silicon by sol-gel dip coating technique. The structure of the iron oxide films were characterized by X-ray diffraction technique. The photoluminescence studies were used to analyze the optical properties. From FT-IR spectroscopic studies, various bonding and their vibration modes are observed.

NSDP16	**Synthesis, Characterization and Photocatalytic Activity of ZnO-Chitosan composite-A Statistical analysis**
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Zinc Oxide a kind of wide gap semiconductor (3.37 eV), higher electron mobility as well as higher breakdown field strength most widely used and studied functional oxides. Chitosan is an amino-polysaccharide, usually produced by partial N-deacetylation of chitin, a major component of the shells of crustacean such as crab, shrimp, and crawfish. Chitosan has been widely used, as it has various properties such as microbial resistance, non-toxicity, biodegradabitility and metal ion absorptibility. Due to the abundance, low cost and good chemical and biological properties, Chitosan is widely used in medicine, nutrition, cosmetics, paper making and several other application fields.

In the present study, Chitosan can be used as binder to the ZnO, to investigate the effect of photodegradation of reactive dye under solar, visible and UV-light irradiation. The binding ability of chitosan for metal ion is attributed to the chelating groups ($-NH_2$ and -OH groups) present in the chitosan. ZnO-Chitosan nanocomposite was synthesized by chemical method and was confirmed by several characterization techniques like UV-DRS, FTIR, XRD, SEM, AFM, etc. A comparative study for the photocataltic degradation of reactive dye was performed. Statistical analysis is a tool to correlate the photocatalytic activity of the catalyst and also explain the error analysis of the work.

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NSDP17	**Synthesis and optical characterization of nanoparticles of Zinc sulphide by chemical precipitation method**
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Nanoparticles of Zinc sulphide (ZnS) were synthesized by chemical precipitation method. The synthesized samples were characterized by X-ray diffraction studies(XRD), Scanning electron microscope(SEM), Energy dispersive spectrometry (EDS), Photoluminescense(PL), UV-vis Spectroscopy and Fourier transform infrared spectroscopy (FTIR)studies. The particle size of ZnS was calculated using Debye-Scherrer formula from the X-Ray Diffraction pattern and found to be 2.32nm. The bandgap of ZnS was calculated by tauc plot method from UV spectral data as 4.18 eV. The room temperature photoluminescence spectra of the powder show the emission peak from 393nm to 425 nm which exhibits blue emission.

NSDP18	**Structural characterization of phase transition of Al_2O_3 nanopowders obtained by gel-coprecipitation method**
	R. Bharthasaradhi and L.C. Nehru* **Department of Medical Physics, School of Physics, Bharathidasan University, Tiruchirappalli-620024, Tamilnadu.**

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Nanocrystalline aluminium oxide (Al_2O_3) powders have been synthesized by the gel-coprecipitation method. This technique is fast, low cost and produces well defined nano size materials. A study of the evolution of crystalline phases of obtained powders was accomplished through X-ray diffraction (XRD) and micro-Raman spectroscopy. The results obtained allow the identification of two steps on the γ-Al_2O_3 to α-Al_2O_3 phase transition. From the XRD patterns for nano powders exhibited the amorphous phases below 1100ºC and the single alpha phase Al_2O_3 was obtained after heat treatment at 1200ºC for 2 h. These observations were also confirmed by Fourier transform infrared (FTIR) and UV-Vis spectrometry measurements. A study of the morphology of the particles was accomplished through measures of crystallite size, specific surface area and transmission electronic microscopy. The particle size is closely related to γ-Al_2O_3 to α-Al_2O_3 phase transition. These results strongly suggest that gel-coprecipitation method is a suitable technique to prepare nanosize α-Al_2O_3 for thermoluminescent (TL) dosimetric applications. Further work is still under way in order to optimize sensitivity for low dose radiation for dosimetry measurements.

NSDP19	**Synthesis and characterization of sulphur doped TiO_2 nanoparticles for enhanced visible light photocatalytic activities by Hydrolysis method**
	A.Viswanathan*, S. Sridhar **[1]Department of Physics, Bharathidasan Institute of Technology, Anna University, Tiruchirappalli-620024.**

Titanium dioxide (TiO_2) is one of the most widely studied metal oxides for photocatalytic application due to its unique electronic and optical properties, high physical and chemical stability, low cost and non-toxicity. However, some drawbacks exist with TiO_2 as it consists of wide band gap energy (3.2 eV) and high rate of electron-hole recombination which restricts the range of practical applications only under UV irradiation. Therefore, much effort has been spent to modify the TiO_2 properties into extending its optical absorption edge from UV to the visible-light region and to decrease the electron-hole recombination rate. To overcome the limitation TiO_2, non-metals can be doped with TiO_2 to enhance the visible light photocatalytic activities. In the present study, Pure and Sulphur doped TiO_2 nanoparticles were prepared by simple Hydrolysis method for photocatalytic application. To obtain sulphur doped TiO_2, the following precursors were used titanium tetrachloride and sodium sulphate with distilled water. The prepared samples were annealed for 500° C to avoid amorphous nature. The band gap energy of sulphur doped TiO_2 was decreased to 2.90 eV compared to pure TiO_2 (3.2 eV). Normally Particle size of both pure TiO_2 and S-TiO_2 were varied from 30nm to 100nm. Anatase and rutile phases were confirmed by XRD for both pure TiO_2 and S-TiO_2 nanoparticles. The photocatalytic activities of prepared samples were investigated under sunlight by taking methylene blue dye as model pollutant. The enhanced photocatalytic efficiency was obtained for S-TiO_2 nanoparticles than pure TiO_2 nanoparticles.

NSDP20	**Formulation of bactericidal cold cream against clinical pathogens using *Cassia auriculata* flower extract synthesized Ag nanoparticles**
	R. Sahana[1], S.C.G. Kiruba Daniel[2], S. Gowri Sankar[3], G.Archunan[4], S. John Vennison[3], M. Sivakumar [2#] **[1]Department of Biotechnology and Genetic Engineering, Bharathidasan University, Tiruchirappalli-620 024.** **[2]Division of Nanoscience and Technology, Bharathidasan Institute of Technology, Anna University, Tiruchirappalli-620 024.** **[3]Department of Biotechnology, Bharathidasan Institute of Technology, Anna University,Tiruchirappalli-620 024.** **[4]Department of Animal Science, Bharathidasan University, Tiruchirappalli-620 024.**

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A simple formulation of bactericidal cold cream using the biosynthesized silver nanoparticles from *Cassia auriculata* flower extract and there antibacterial activity was tested against various clinical pathogens such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Staphylococcus epidermidis*. An eco-friendly method was followed for the biosynthesis of silver nanoparticles using *Cassia auriculata* flower extract as reducing agent at room temperature. The effect of different concentrations of flower extract and the various pH conditions of the reaction medium towards the formation of nanoparticles were studied. Surface Plasmon Resonance peaks were obtained from 403nm to 428nm. Further the synthesized nanoparticles were characterized by Dynamic light scattering particle size analysis (DLS), Zeta potential analysis, Atomic Force Microscope (AFM), High Resolution Transmission Electron Microscopic analysis (HRTEM).

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About the University

Bharathidasan University was established in Tiruchirappalli, Tamil Nadu by the Government of Tamil Nadu in 1982 through Bharathidasan University Act, 1981. The university started functioning with effect from February 4, 1982. The University was named by the great revolutionary Tamil Poet, Bharathidasan (1891–1968). 'புதியதோர் உலகம் செய்வோம்' (We will Create a Brave New World) poetic words of Bharathidasan is the motto of the University. Bharathidasan University has several faculties such as Arts, Science, Engineering and Technology, Indian and other Languages and Management. The main campus is located in a sprawling area of over 1000 acres of land on the Tiruchirappalli-Pudukkottai high way. Besides the main campus, there is a city campus at Khajamalai. Bharathidasan Institute of Management (BIM) is located in BHEL campus with whose partnership BIM has emerged as one of the top Business Schools of the country.

About the Centre

Centre for Nanoscience and Nanotechnology was established in 2008 to address the various issues of science and technology considering the interdisciplinary nature of emerging field cutting across Science, Engineering and Technology. The university has funded about 10 million Indian Rupees to develop infrastructure for the fabrication and probing of nanostructured materials. The centre has successfully completed four research projects with the grants in the tune of Rs. 3.3 crores supported by DST-Nanomission, DST-TSG, DST-SERC and DBT-Nanomission. Further, the centre has one ongoing research project supported by UGC. The vision of the centre is to undertake Research & Development and establish leadership, to educate and train a new generation of students with truly interdisciplinary skills. The centre has actively involved on the diverse areas of research activities such as (i) Fabrication of one-dimensional semiconductor nanostructures for nanoelectronics, optoelectronics and hydrogen generation, (ii) Interfacing nanostructures with biosystem for diverse and exciting applications in lifesciences, (iii) Surface plasmon resonance assisted photothermia for targeted drug delivery, (iv) Large area epitaxial graphene and liquid phase exfoliated graphene quantum dots and (v) High efficient organic light emitting device.