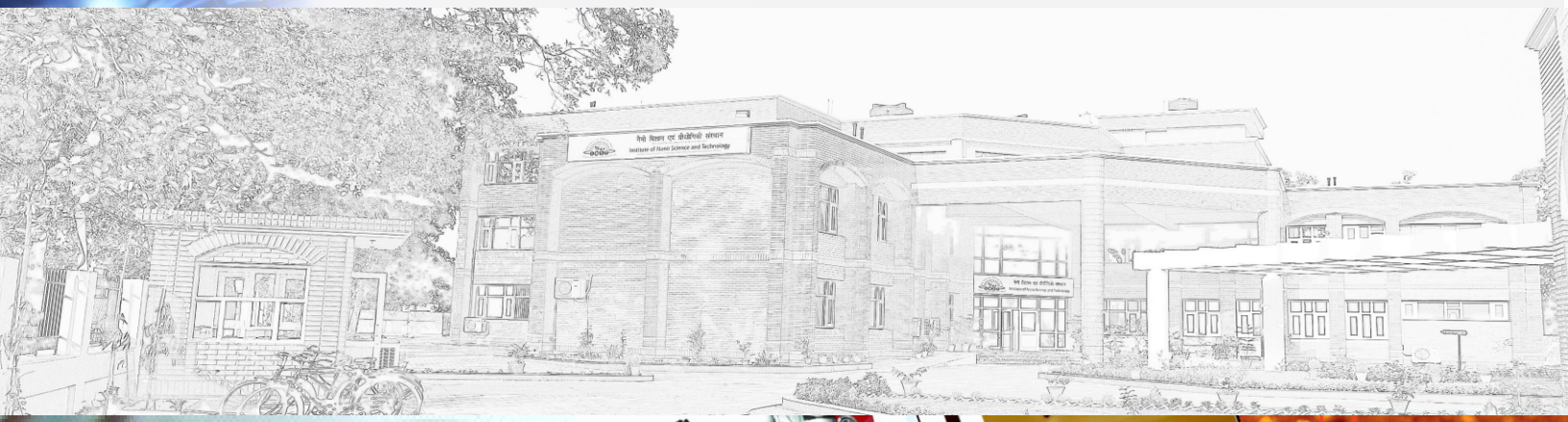
नैनो विज्ञान एवं प्रौद्योगिकी संस्थान

(विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार का एक स्वायत्त संस्थान)

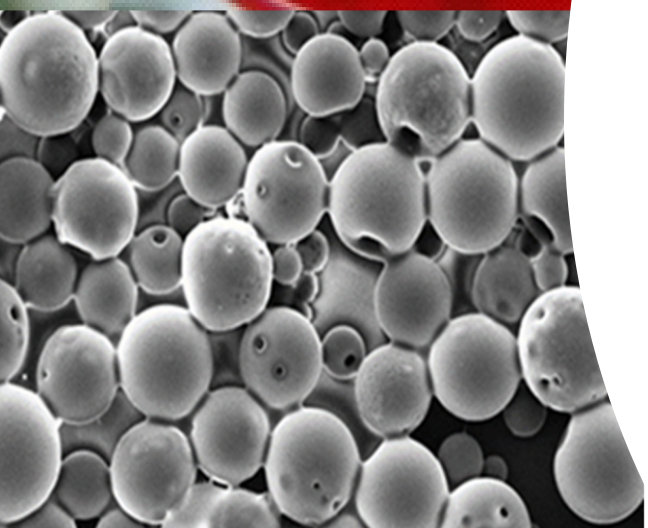
INSTITUTE OF NANO SCIENCE AND TECHNOLOGY

(An autonomous institute supported by Department of Science and Technology, Govt. of India)



वार्षिक प्रतिवेदन

ANNUAL REPORT 2015-2016



नैनो विज्ञान एवं प्रौद्योगिकी संस्थान

INST

Institute of Nano Science and Technology

Annual Report compiled by:
Mr. Mukesh Raja (Sc. B), Dr. Neha Sardana (Sc. B) & Dr. Tapasi Sen (Sc. C)
Cover & Backpage design by Dr. Vivek Bagchi, (Sc. B)

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FROM THE DESK OF DIRECTOR

It has been a year of further growth and development at the INST, Mohali and I am indeed very pleased to bring this report while taking stock of where we stand today. The Institute of Nano Science and Technology, Mohali was conceived by the Govt. of India as an institution of research and for developing technologies based on Nano Science and Technology. The third year of INST's growth has been significant and noticed by various practitioners of science as well as society. As INST entered its fourth year, we have accelerated our efforts in multidisciplinary facets of research in nanotechnology as well as the myriad academic activities. Last year's funding of research projects and initiatives taken at INST improved the research opportunities at INST. Extramural grant from different funding agencies have been received for projects submitted by almost every faculty.

Six new faculty members joined this year bringing the total strength of regular faculty to 34. The new members have initiated studies in the area of Functional organic materials, Polymer chemistry, Computational materials Science, Supramolecular soft nanomaterials for organic electronics and therapeutics, graphene-based composite materials. Joining of Chief Finance and Administrative Officer has strengthened the administration side.

On the academic front INST currently has 36 students enrolled in Ph.D programme and 12 Post-Doctoral fellows apart from 15 research fellows in projects.

The institute has created research laboratories in the current space and in neighboring institutes, which are key to doing research in nano science and technology. Our research towards engineering of nanomaterials for various applications resulted in generation of some new concepts and technologies. Some of them I would like to mention here;

Low Cost Water purification devices: Low-cost, non-toxic and high surface area, functionalized nanomaterials have been developed for the purification and recycling of industrial as well as domestic wastewater. These nanomaterials show excellent adsorption capacity and remove >99 % of the toxic organic compounds along with >90 % of the hazardous metal ions present in wastewater. The materials also exhibit great recyclability and work well under both acidic and basic pH conditions. This invention holds great potentiality for practical applications in recycling domestic as well as industrial wastewater to solve the burning problem of water scarcity in India. This technology was showcased in India International Science Festival (IISF 2015), held at IIT, Delhi during 04-08th December and also in 103rd Indian Science Congress was held at University of Mysore, Mysuru, Karnataka from 03-07th January,2016 and is being phased at pilot plant stage.

Low cost Aptasensor for Cardiac Biomarker, Myoglobin: INST has screened specific DNA aptamers selected from the pool of random-sequence oligonucleotides and demonstrated its usage in a newly developed direct electron transfer based assay format for Myoglobin detection on nanostructured aptasensor. The electrochemical sensing platform is capable of detecting Myoglobin in patient's blood sample within a range of 1pg/mL to 16µg/mL in just four hundred rupees making the system more sensitive and cost-effective than any other commercial patent available device.

In addition to this, INST Scientists in collaboration with IISER, Mohali and IIT, Delhi have demonstrated Unconventional Superconductivity at Mesoscopic Point-contacts on the Cd3As2 (Nature Materials 2016, 15, 32-37).

Scientists have demonstrated that amyloid aggregates can be used to develop advanced enzyme matrices for potential industrial applications. Scientists have achieved high quality atomically well-defined nano-steps and terraces surface (Solid State Communications, 213, 28, 2015) of SrTiO3 perovskite oxide by using a unique chemical free "hot" water etching technique.

At this stage, I would also like to mention some important collaborations in which scientists of INST are involved with:

- DIHAR, DRDO on projects related to high altitude ailments and food packaging.
- IISER, Mohali in the areas of superconductivity and two dimensional nano materials.

- IIT, Delhi on toxic insults of nanoparticles on natural microbial population and habitat
- Punjab State Council for Science and Technology (PSCST) for dissemination of Science and Technology to the society. Instituted a lecture in the field of Bio-Science and named the same after the eminent Punjabi Nobel Laureate and Bio-Scientist Prof. Har Gobind Khorana. In this direction, the first lecture under this series was delivered by Sir Venkatraman Ramakrishnan, Nobel Laureate on 05th January 2016.

Along with the key mandate of nanoscience and Technology based research, INST has been involved in promoting science among young generation of the nation. As a part of this programme, faculty including Director, INST have interacted in the past two years with students of nearly 150 schools in rural/remote areas across the country in the state/UT of Assam, Chandigarh, Himachal Pradesh, Kerala, Meghalaya, Punjab, Orissa, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal. In addition to this, INST has instituted other outreach activities like: (a) North-Eastern Education Developmental programme (NEED) and CPVS (Chhatra Protsahan Vyakhyan Shrankhala) (b) Women Outreach programme for upliftment of women in weaker section of the society with an idea to create awareness of hygiene, first aid, importance of education, general awareness (c) adopted three schools in nearby areas which will be nurtured by INST; (d) Outreach awards for the meritorious students and outstanding teachers; (e) workshops (Nano for Children, Motivational contact Programme) for students/parents/teachers to give them an idea of what can children do with science. INST has coordinated an Outreach road show, which is probably the first in India, where science was demonstrated through experiments to common people at a public place (Sector-17 market, Chandigarh). Nearly 500 people from all walks of life in addition to 200 school children visited the road show.

On the Industrial front, INST has made significant progress. Six industrial projects are underway and six more are currently being discussed and will be formalized soon.

I would like to express my gratitude to Chairperson and members of Board of Governors for their visionary guidance and valuable support. I am also grateful to all the local authorities of Punjab like Greater Mohali Area Development Authority (GMADA), Punjab State Council for Science and Technology (PSCST) and institutions of CRIKC, especially IISER, DIHAR, Panjab University, CIAB, NABI, NIPER, CSIO and other institutes of Higher Educations for encouraging INST in all activities. Finally, I would like to thank our parent organization, Ministry of Science and Technology, Government of India, and especially the Autonomous Institutions (AI) cell for extending their full cooperation and financial support. I am also thankful to the Research and Academic Advisory Council (RAAC) for their encouragement to our scientists/students and constructive and critical comments. I really wish to thank the Building Works Committee (BWC) for spending enormous time in deliberations to go through all the processes with great care and proper procedure to enable the process of construction activities. I would also like to thank the Finance Committee for guiding us and helping us in achieving the objectives in matter of accounting /purchase and other matters according to the Government of India rules.

In the end, I would like to assure you that hard-work put in by faculty and staff of INST will continue year-after-year and will make this institute a leading research institute in the area of Nano Science and Technology recognized globally, where efforts in research will translate to society. It has been my pleasure to devote all my time and energy to see that the institute grows in the direction that the visionaries of this institute and Govt. of India had in mind and I will do my best to achieve the next goal.

(Prof. Ashok K Ganguli)
Director

2. VISION, MISSION, OBJECTIVES AND FUNCTIONS

VISION

To emerge as globally competitive India's foremost research institution in Nano Science and Technology and to contribute to the society through application of nanoscience and nanotechnology in the field of agriculture, medicine, energy and environment.

MISSION

To be a world class research institution by carrying out cutting-edge research through outstanding scientists from different branches of science and engineering, encouraging them to carry out their individual scientific research to be published in the best journals along with their mandate to jointly work on interdisciplinary projects to develop devices/technologies based on nano science and technology. To encourage all aspects of nanoscience and nanotechnology with major thrust on the following areas: agricultural nanotechnology, sensors, medical nanotechnology, nanotechnology based solutions for energy and environment. The ultimate goal is to make a difference to society through nanoscience and technology.

OBJECTIVES

- Resource building – infrastructure and manpower
- Enhance research activity in Nano Science and Nano Technology
- Training students in PhD programme in Nano Science and Technology
- Foster interactions between leading scientists of the world in Nano Science and Technology
- Impart advanced training courses and laboratory techniques of nanotechnology at the highest level
- Organizing important national and international level seminars and conferences
- Encouraging innovative and challenging technology/product based scientific projects
- Publish scientific papers of in the best journals
- Generating patents in Nano Science and Technology
- Encouraging translational research (from laboratory to industry)
- Special thrust to innovate and to apply science for benefit to society
- Sensitizing public and media about the advantages and safeguards in Nano Science and Technology

FUNCTIONS

To facilitate the growth of understanding of developing technologies which are globally competitive acclaimed level. Efforts shall be carried on relentlessly by supporting and encouraging young researchers and scientists with state-of-the-art infrastructure and through a challenging work environment.

Though all aspects of nanoscience and nanotechnology will be encouraged, some of the key research projects of the institute would be as follows:

- Water purification, Water splitting and Carbon dioxide sequestering
- Carbon based nanostructures & devices
- Nanostructures for Li-ion batteries
- Flexible electronics
- Smart polymers
- Devices based on 2 D nanostructures
- Band-gap engineering for efficient solar photo-catalysts
- Thermal insulation and thermoelectronics
- Low-cost microfluidic devices for food, security, health and agriculture
- Interactive nano-packaging for extending food shelf lives
- Cancer Nano therapeutics
- Tissue engineering for research, products targeting wound healing

3. DECISION MAKING BODIES

BOARD OF GOVERNORS (BOG)		
Chairperson: Bharat Ratna, Prof. CNR Rao		
Prof. Ashutosh Sharma Secretary, DST	Dr. K. VijayRaghavan Secretary, DBT	Dr. S. Ayyappan Secretary, DARE, ICAR
Sh. Surjit K Chaudhary Secretary, Dept. of Chem & Fertilizers	Sh. Vinay Sheel Oberoi Secretary, Dept. of Higher Education, MHRD	Sh. J.B. Mohapatra JS & FA, DST
Prof. A. K. Sood IISc, Bangalore	Prof. M.K. Sanyal SINP, Kolkata	Prof. N. Sathyamurthy Director, IISER Mohali
Prof. Ramgopal Rao Director, IIT, Delhi	Prof. Shantikumar V. Nair AIMS, Kochi	Prof. A.K. Ganguli Director, INST Mohali
Sh. Jaspal Singh Secretary, Punjab Govt. Dept. of Sc., Tech. and Env.	Dr. N. Jerath Executive Director PSCST, Chandigarh	Shri U. C. Prasad CFAO, INST, Mohali Member-Secretary

RESEARCH AND ACADEMIC ADVISORY COUNCIL (RAAC)	
Chairperson : Prof. Milan K Sanyal Saha Institute of Nuclear Physics, Kolkata	
Members Prof. V Ramgopal Rao Director, Indian Institute of Technology Delhi	Prof. D D Sarma Head, Department of Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore
Prof. Shantikumar V. Nair Director, Amrita Centre for Nanosciences and Molecular Medicine, Kochi	Dr. (Mrs) Neelima Jerath Executive Director, Punjab State Council for Science & Technology, Chandigarh
Prof. Amit K. Dinda Head, Department of Renal Pathology, All India Institute of Medical Sciences (AIIMS), New Delhi	Prof. Ashok K Ganguli Director, Institute of Nano Science and Technology, Mohali
Prof. Santanu Bhattacharya Director, Indian Association of Cultivation of Science , Kolkata	Dr. P. Neelakandan, Sc. E Member - Secretary, Institute of Nano Science and Technology, Mohali (Punjab)

FINANCE COMMITTEE			
Chairperson: Prof. Ashok K. Ganguli			
Sh. J.B. Mohapatra Member Joint Secretary & Financial Advisor DST, New Delhi	Dr. Praveer Asthana Member Scientist G & Head (AI) DST, New Delhi	Sh. P. G. Basak Member Deputy Registrar IIT Delhi, NewDelhi	Sh. U. C. Prasad Member Secretary Chief Finance & Administrative Officer INST - Mohali

4. ACADEMIC PROGRAMMES

4.1 Ph.D - Level courses floated by INST at IISER, Mohali

Sr.	Course Code	Title of the Course
1.	INS 651	Biomolecular Interactions: Spectroscopic and Calorimetric Methods
2.	INS 652	Characterization of Nanomaterials
3.	INS 653	Chemistry of Nanomaterials: Synthesis, Properties and Applications
4.	INS 654	Electron Microscopy
5.	INS 655	Photoluminescence spectroscopy with emphasis on applications in Material Science including nanomaterials
6.	INS 656	Biomolecular self-assembly
7.	INS 657	Carbon Nanomaterials and its applications
8.	INS 658	Nanobiotechnology and nanomedicines: Basics and Applications
9.	INS 659	Thermal properties at Nanoscale

4.2 Ph.D. Students of INST:

Sr.	Name of Student	Research Area
1.	Mr. Soumen Ash	Superconductivity in mesoscopic systems
2.	Ms. Rashmi Jain	Bio-inspired hydrogels for healthcare
3.	Ms. Devanshi Bhardwaj	Photocatalysis
4.	Ms. Ritu Rai	Mixed carbide nanostructures for electrocatalysis
5.	Mr. Ashmeet Singh	Smart Gels
6.	Mr. Ankur Sharma	Pulmonary Delivery of Antimicrobial Peptides using porous nanoparticle aggregates (PNAPs) against tuberculosis
7.	Mr. Dimple	Computational modeling in energy relevant nano- materials and molecular electronics
8.	Mr. Naimat Kalim Bari	Cell free Bio-reactors from the Shell Proteins of Bacterial Micro compartments
9.	Ms. Swati Tanwar	Plasmonic nanostructures based on DNA origami
10.	Mr. Munish Shorie	Low cost immunodiagnostics for cardiac management
11.	Mr. Rajinder Kumar	Nano-structured materials for electro and photo-electro chemical applications
12.	Mr. Pulkit	Mesoporous Silica Nanoparticles for controlled and targeted nutrient delivery in plants
13.	Mr. Nityasagar Jena	Computational studies on nanomaterials for gas sensors
14.	Mr. Anirban Kundu	Opto-electronic properties of Graphene

INST's Ph. D & Post Doc students

15.	Ms. Neha Wadhera	2DEG at the interface of a strong spin or bit coupling perovskite oxide.
16.	Mr. Atul Dev	Synthesis and characterization of Nanocomposites and there usage in nanotheraputics.
17.	Ms. Renu Rani	Development of MoS2 based opto - electronic devices and sensors.
18.	Ms. Harmanjit Kaur	Bio-receptor functionalized nanostructured sensing platform.
19.	Mr. Sandeep	Eccentric inorganic polymeric nanoparticles for plant disease control in complementary fashion.

20.	Ms. Ruchi Tomer Km	Electronic and magnetic properties of oxide interface and super lattices
21.	Rashmika Singh	Neurotoxicity of Nanoparticles
22.	Pranjali Yadav	Graphite Carbon Nitride Nanostructures for biomedical applications
23.	Ankush Garg	Exploring the cellular determinants of P53 aggregation in cancer
24.	Harsimran Kaur	Supramolecular hydrogels and Tissue Engineering
25.	Prabhjot Kaur	Electronic and Thermal properties of strong spin- orbit coupling systems
26.	Anas Ahmad	Synthetic Lethality and Cancer - Targeted Cancer Therapy by small molecule inhibitors / nano-formulations
27.	Jojo P Joseph	Synthesis and applications of polymeric nanoparticles
28.	Pushpendra	Photocatalytic water splitting by semiconductor nanomaterials
29.	Taru Dubey	Development of biocompatible nanostructures capable of traversing the blood brain barrier for targeting glioblastoma/brain tumors
30.	Mr Navbhar Sharma	Development of Bacteria mediated delivery of Magnetic nanoparticles for cancer therapy
31.	Mr Arif Hassan Dar	Synthesis and Applications of a New Class of Strong Organic Acceptors
32.	Mr Krishna K. Yadav	Metal borides
33.	Mr K Ravikumar	Biomimeticw Water oxidation by cobalt and manganese based oxide nanomaterials
34.	Ms. Guratinder Kaur	Spin-transport in 2DEG at the interface/surface of a perovskite oxide
35.	Ms Shabi Parvez	Nanotherapeutic approach for targeting intracellular parasite Leishmaniasis donovani

4.3 POST-DOCTORAL FELLOWSHIP PROGRAMME:

INST has a vibrant Post-Doctoral Programme which was started in 2014. Candidates are selected through stringent interview after applications are invited through advertisement in National newspapers and Current Science. The postdoctoral fellowship is for a period of 3 years reviewed annually through presentation in presence of external experts.

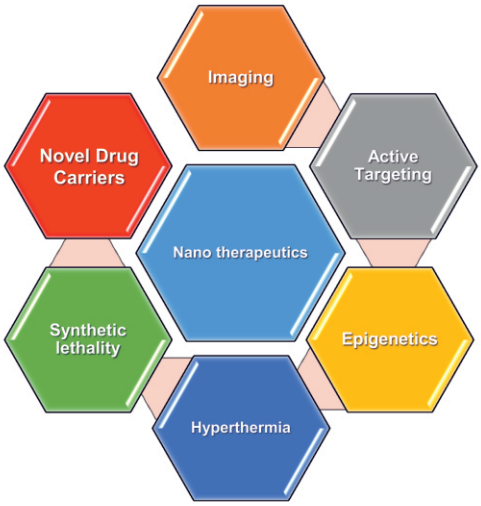
Post-Doctoral Fellows:

Sr.	Name of the Fellow	Ares of Research
1.	Dr. Madhunika Agrawal P.h.D, GNDU	Protein based Nanoparticles for Drug Delivery in Cancer *(till 02/11/2015)*
2.	Dr. Vinod Kumar P.H.D, B.H.U	Applications of nanomaterials for theranostic purposes *(till 01/2/2016).*
3.	Dr. Sanjeev Kumar Yadav P.H.D, B.H.U	Nano-formulation for the prevention of Cancer and Neurodegenerative diseases *(till 30/9/2015)*
4.	Dr. Gaganpreet Ph.D, Panjab University	Dynamical behaviour of fluids inside nanochannels
5.	Dr. NVSP Sameera Ivaturi P.H.D, IISc, Bangalore	Synthesis and characterization of nan omaterials (1D/2D nanostructures, composites Field Emission Studies of above mentioned systems
6.	Dr. Ravi Bhatia IISc, Bangalore	Synthesis and characterization of nanomaterials (1D/2D nanostructures, composites Low temperature charge trans port of low dimensional and percolating systems
7.	Dr. Manu Sharma Ph.D, IIT Roorkee	Metal Oxide Nano Particles for Catalytic Applications
8.	Dr. Nishanthi S T Ph.D. Manonmaniam Sundaranar University (Tamil Nadu)	Nano structured carbon nitride and metal oxides for visible light photoelectrochemical & photocatalytic water splitting + Synthesis and characterization of nanoadsorbents for water purification
9.	Dr Seema Gautam Ph.D, Panjab University	Atomic scale investigation of activation and adsorption of hydrocarbon over metal clusters through first principles electronic structure method
10.	Dr. Waseem Ahmad Wani Ph.D. Chemistry, Jamia Millia Islamia, New Delhi	Dynamic covalent chemistry approaches for organic nanoparticle synthesis and their applications as sensors and drug delivery systems
11.	Dr. Shaswat Barua Ph.D, Tezpur University	Biopolymers and biomimetic macromolecules for therapeutic applications
12.	Dr. Arabinda Baruah Ph.D. IIT Delhi	Development of functionalized nanomaterials for water treatment
13.	Dr. Swayamprava Dalai PhD, VIT University	Experimental Evaluation of Nanoformulated Drug Delivery Systems for Cancer Research
14.	Ms. Anuradha Gupta Ph.D, CSIR-Central Drug Research Institute (CDRI)	Nanoparticle mediated cancer therapies: Utilizing Synthetic Lethality approach
15.	Dr. Kulvinder Singh Ph.D, Panjab University	Carbon based hetrostructures for super capacitance and sensing application
16.	Mr. Vijay Kumar PhD: D.C.R. University of Science & Technology	Nanostructured mesoporous materials for VOCs detection and photocatalytic applications
17.	Dr. M Manolata Devi PhD, IIT Kanpur	Designing new multifunctional nanomaterials for photo voltaic applications

5. RESEARCH AREAS

I. NANO-THERAPEUTICS

This group is engaged to develop nanotechnology-based drug delivery devices for the detection and treatment of multiple human ailments using a nano-platform in a cost effective manner. Aim is to explore the molecular mechanisms of cancer pertaining to chemoresistance, novel proteomic/epigenetic drug targets and to develop affordable advanced nanotherapeutics approaches to treat cancer. The group aims to develop organic solvent free aqueous based nanoformulation of poorly soluble hydrophobic anticancer drugs utilizing nanoparticles as promising carriers for gaining higher bioavailability and therapeutic efficacy. Inorganic degradable nanoparticles are being formulated for combinatorial approach towards image guided treatment and management of deep rooted tumors. Also, peptide nanostructures are being tailored to traverse the blood brain barrier (BBB) for glioblastoma therapy. The group also aims in developing nanotherapy for epigenetic regulation of glioblastoma, neuroblastoma and leukemia. The group has undertaken studies to simulate the metastasis process via cells-on-chips fabricated in combination with 3D cell culture system mimicking different microenvironment conditions.



Ongoing projects:

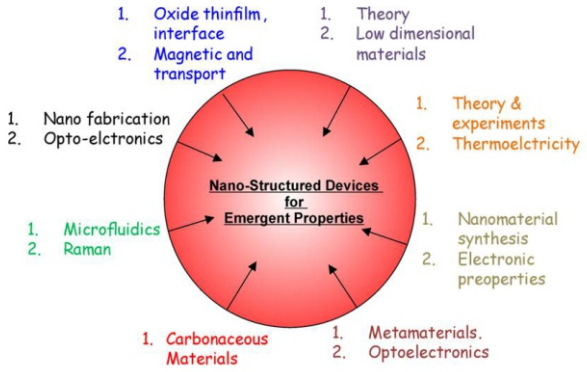
1. Development of Versatile, Multifunctional and Adaptable Peptide Nanofiber Scaffolds with Potential for Promoting Neuritogenesis in Brain Injury, INSPIRE faculty Award. Dr. J. J. Panda
2. Nanoparticle-mediated inhibition of PRDX2 for selective killing of CHEK2-defective colorectal cancer cells by synthetic lethality. SERB, DST. Dr. R. Khan
3. Identification of Polycomb and c-Myb signaling and their targeted nanotherapy in leukemogenesis. SERB, DST. Dr. S. R. Choudhury
4. Nanotherapy for controlling epigenetic regulation by polycomb in Myb mediated leukemia. DBT. Dr. S. R. Choudhury

Selected publication(s) from the Group:

1. Meka, A. K.; Niu, Y.; Karmakar, S.; Hartono, S.B.; Xiang, C.; Lin, C.; Zhang, H.; Whittaker, A.; Jack, K.; Yu, M.; Yu, C. Facile Synthesis of Large-Pore Bicontinuous Cubic Mesoporous Silica Nanoparticles for Intracellular Gene Delivery. Chem Nano Mat 2016, 2, 220.
2. Sharma, D.; Puri, M. The Inhibitory Effect of Stevioside on Bacillus cereus Growth in Milk: Validation and its Response Surface Optimization. Current Biotechnology, 2015, 4, 56.
3. Panda, J. J.; Mishra, J. Self-assembled dipeptide-based nanostructures: tiny tots with great applications. Ther Deliv. 2016, 7, 59.
4. Alam, S.; Panda, J. J.; Mukherjee, T. K.; Chauhan, V. S. Short peptide based nanotubes capable of effective curcumin delivery for treating drug resistant malaria. J. Nanobiotechnology 2016, 14, 26.
5. Varshney, A.; Panda, J. J.; Singh, A. K.; Rooge1, S. B.; Biswas, S.; Sarin, S. K.; Chauhan, V. S. Enhanced and effective delivery of micro rna by using ligand modified self-assembled cationic dipeptide nanoparticles in hepatocellular carcinoma (hcc). Journal of Hepatology 2015, 62, S411.

II. NANOSTRUCTURED DEVICES

This group comprising of experimentalists and theorists to understand and apply "Emergent Phenomenon" in nanostructured devices, that will be useful for future generation spin-electronics and energy devices.



Achievements:

i. Clean nano-lithography
ii. Low cost MEMS fabrication for sensors
iii. Two dimensional electron gas at oxide surface-interface.
iv. High thermo-power materials

Ongoing projects:

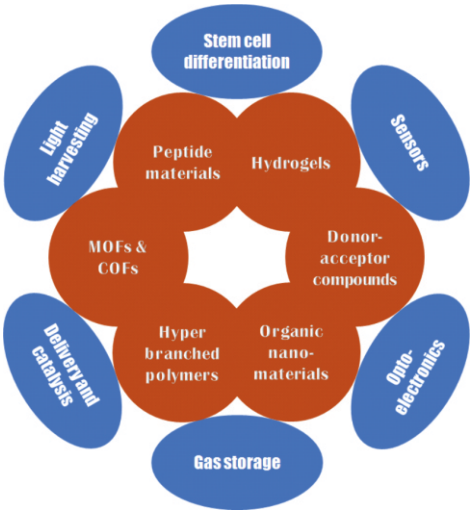
1. Magneto-opto-electronic properties and applications of 2- Dimensional electron gas system at oxide interfaces, DST Nano Mission
2. Design, Growth and Investigation of New Multiferroic materials, DST SERB
3. Tailorable plasmonic metamaterial substrates, DST ECR
4. Devising reduced graphene oxide (rGO) based non-cryogenic micro-bolometer for infrared sensing, DST SERB

Selected publication(s) from the Group

- Prakash, B.; Chakraverty, S. Realization of atomically flat steps and terraces like surface of SrTiO 3 (001) single crystal by hot water etching and high temperature annealing. Solid State Communications 2015, 213, 28.
- Prakash, B.; Chakraverty, S. Realization of single-terminated nano step-and terrace-like surface of SrTiO3 single crystals. Current Science 2015, 108.
- Tsuyama, T.; Matsuda, T.; Chakraverty, S.; Okamoto, J.; Ikenaga, E.; Tanaka, A.; Mizokawa, T.; Hwang, H. Y.; Tokura, Y.; Wadati, H. X-ray spectroscopic study of BaFeO3 thin films: An Fe4+ ferromagnetic insulator. Phys. Rev. B 2015, 91, 115101.

III. SOFT NANOSTRUCTURES

The goal of Soft Nanostructures Group (SNG) is to pioneer research in organic soft materials and develop technologies based on them. Currently, four scientists are working in SNG whose expertise range from synthetic (organic and polymer) chemistry to physical chemistry and chemical biology. The mandate of SNG is to develop soft materials such as hydrogels, macromolecules, biomolecule-mimics and framework materials for applications in therapeutics, catalysis and organic electronics.



Research areas :

- Stimuli-responsive materials from peptides and single chain polymeric nanoparticles for catalysis, drug delivery and self-healing applications
- Tailoring organic nanomaterials for biomedical and optoelectronic applications
- Photochemistry of organic nanomaterials
- Peptide nanomaterials for tissue regeneration

Ongoing projects:

1. Stimuli-responsive collapse of tailored single chain functional polymer to diverse hierarchical nanostructures for catalysis and self-healing applications, A. Pal, DST-SERB-ECR.
2. Synthesis and Photophysical Study of New Class of Push-Pull Chromophores for Optoelectronic Applications, G. Jayamurugan, Ramanujan Fellowship.
3. Synthesis of a New Class of Strong Organic Acceptors and their Nanoparticles Formulation for Sensing Application, G. Jayamurugan, DST-SERB-ECR.
4. Organoboron macrocycles as adaptable, photoactive materials. P. Neelakandan, DST-SERB-ECR.
5. Smart Gels for Green Energy Applications, S. Roy DST-SERB Young Scientist.
6. **Industrial Project:** Surface modification for better adhesion property between Rubber and textiles, S. Roy, A. Pal, G. Jayamurugan and AK Ganguli, SRF Ltd., Chennai.

Selected publication(s) from the Group

- Jayamurugan, G.; Gowri, V.; Hernández, D.; Martin, S.; González-Orive, A.; Dengiz, C.; Dumele, O.; Pérez-Murano, F.; Gisselbrecht, J.-P.; Boudon, C.; Schweizer, W. B.; Breiten, B.; Finke, A. D.; Jeschke, G.; Bernet, B.; Ruhlmann, L.; Cea, P.; Diederich, F. Design and synthesis of Aviram-Ratner- type dyads and rectification studies in Langmuir-Blodgett (LB) films. Chem. Eur. J. 2016, In print.

IV. NANOTECHNOLOGY FOR ENERGY AND ENVIRONMENT

Energy group is actively involved in developing nanostructured carbonaceous materials for different energy applications. For eg., high transmittance with high hydrophobic non-corrosive antireflective coating of graphene/nanoporous-silica heterostructure is designed for advance solar devices. In the energy storage area, 3D-reduced graphene oxide self-assembled on copper wire modified with electrochemically generated copper foam was directly used to fabricate binder-free wire-based supercapacitor. In another work, macroscopic graphene-MoS2 based heterostructure materials as high performance solid state 2D supercapacitor were developed.
In the area of photocatalysis, nanoporous carbon nitride-CoO composites, MOFs and COFs were being developed for photocatalytic water splitting to generate hydrogen. Nanostructured CaMnOx materials for photocatalytic water oxidation were being developed in our group. New nanoscale materials of metal carbides and nitrides with rational control of morphology, size, structure, composition and doping are developed and applied in electrocatalytic hydrogen generation. Nanostructured cellulose materials being developed for high performance thermal insulation applications. Another major focus of the group is on Environmental remediation, various nanomaterials were prepared via waste recyclization and applied in the removal of Arsenic and Fluoride from water. Prototype water purification cartridges have already been developed and patent process and industrial interaction is in progress.

Applications:

- Photo- and electro-catalytic Water Splitting (H2 generation)
- Environmental Remediation (Water Purification & Pollutant degradation)
- Porous Organic Frameworks for Gas Capture, Storage & Conversion (COFs & MOFs)
- Artificial Light Harvesting Materials (Plasmonic Single molecule Fluorescence)
- Electrochemical devices for energy storage (Batteries, Sensors, Fuel Cells & Supercapacitors)
- Thermoelectric Devices (Waste heat recovery & Energy efficient buildings)

Ongoing Projects

1. Bio-mimicking photocatalytic water oxidation using Manganese and Cobalt based oxide nanomaterials: understanding the effect of redox inactive metal ion DST-SERB-ECR.
2. First-Row Transition Metals in Catalytic Atom/Group-Transfer Functionalization of Hydrocarbons SERB, DST.
3. Plasmonic enhancement of single molecule fluorescence by metallic nanoantennas assembled on DNA origami DST-SERB-ECR.
4. Nanoporous Materials for Carbon Dioxide Sequestration DST-SERB-ECR
5. Self-assembled nanostructure for Photocatalysis DST-SERB-ECR
6. Nano-structured Materials Synthesized from Transition Metal Carbides / Nitrides for Electro catalytic Applications DST-SERB-EMR
7. New class of flexible solid-state supercapacitor from nano-engineered carbonaceous materials, DST-SERB-EMR
8. Towards the development of hybrid supercapacitor-biofuel cell technology and devices DST INSPIRE

Selected publication(s) from the Group

- Sharma, M.; Ojha, K.; Ganguly, A.; Ganguli, A. K. Ag3PO4 nanoparticle decorated on SiO2 spheres for efficient visible light photocatalysis. New J. Chem. 2015, 39, 9242.
- Chen, Z.; Pronkin, S.; Fellinger, T.; Kailasam, K.; Vilé, G.; Albani, D.; Pérez-Ramírez, J.; Antonietti, M.; Dontsova. D. Merging Atom Disperse Silver and Carbon Nitride to a Joint Electronic System via Co-Polymerization with Silver Tricyanomethanide. ACS Nano 2016, 10, 3166.
- Indra, A.; Menezes, P. W.; Kailasam, K.; Hollmann, D.; Schröder, M.; Thomas, A.; Brückner, A.; Driess, M. Nickel as a co-catalyst for the photocatalytic hydrogen evolution on graphitic-carbon nitride (sg-CN): what is the nature of the active species? Chemical Communications 2016, 52, 104.
- De, S.; Singh, J.; Prakash, B.; Chakraverty, S.; Ghosh, K. Graphene/Nanoporous-Silica Heterostructure based Hydrophobic Antireflective Coating. Materials Today Communications.
- Ghosh, K.; Ranjan, N.; Verma, Y. K.; Tan, C. S. Graphene–CNT hetero-structure for next generation interconnects. RSC Advance.
- Saha, S.; Vaidya, S.; Ramanujachary, K. V.; Lofland, S. E.; Ganguli, A. K. Ternary alloy nanocatalysts for hydrogen evolution reaction. Bull. Mater. Sci. (accepted).
- Chmielowski, R.; Péré, D.; Bera, C.; Opahle, I.; Xie, W.; Jacob, S.; Capet, F.; Roussel, P.; Weidenkaff, A.; Madsen, G. K. H.; Dennler, G. Theoretical and experimental investigations of the thermoelectric properties of Bi2S3. J. Appl. Phys. 2015, 117, 125103.
- Georg KH Madsen, Ankita Katare, Chandan Bera. (2015): Calcuating the thermal conductivity of the silicon clathrates using the quasi-harmonic approximation. Physica Status Solidi A: Applications and Materials Science.

Patent (filing under process):

1. A.K. Ganguli, Menaka Jha, Arabinda Barua, Bharat Kumar, Santanu Ghosh and Debalaya Sarkar, New economical process for conversion of Starch into water purification and field emission devices, Application under progress with PIC-Punjab State Council for Science & Technology.
2. A.K. Ganguli, Arabinda Barua, Menaka Jha, Development of Cartridge for the Removal of Lanthanide ions from Water.
   Application under progress with the help of FITT-IIT Delhi.

V. CHEMICAL BIOLOGY :

The Chemical Biology Group pursues research in different realms of chemistry and biology with special emphasis on therapeutic diagnostics and formulations, disease mechanisms, agricultural sciences, and toxicology and understanding phenomena at the nano scale. At present the group is working towards development of inhalable formulations for tuberculosis and pulmonary edema; drug delivery system for Leishmaniasis; drug delivery system for epigenetic and EMT regulation in Cancer; natural biomaterial based haemostats for management of gunshot injury; efficient pesticide delivery systems and understanding interactions in supramolecular protein cages.

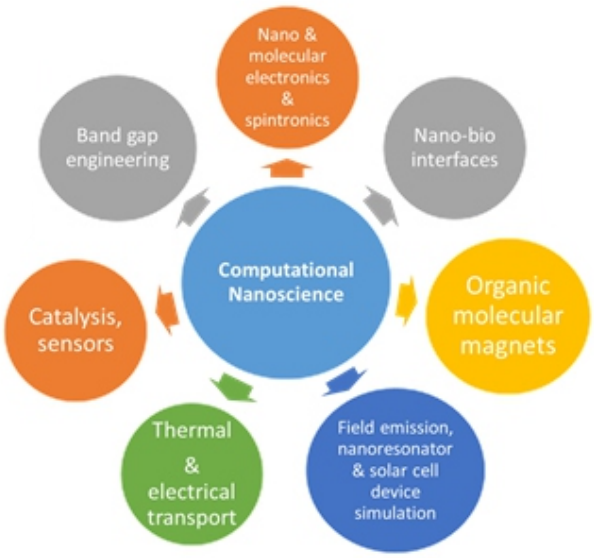
Ongoing Projects:

1. Smart packing system with the nanocomposite to improve the shelf life of perishable vegetable, DRDO
2. Cell Free Bioreactors from the Shell Proteins of Bacterial Microcompartments, SERB
3. Pulmonary delivery of Host Defence Peptides (HDP) using Porous Nanoparticle-Aggregate Particles (PNAPs) for alveolar macrophage targeting in pulmonary tuberculosis, SERB
4. Design of controlled and targeted agricultural pesticide delivery nano-carrier with copper-graphene oxide composite, SERB
5. Assessment of maternal, reproductive and fetal toxicity induced by intrauterine exposure of carbonaceous nanomaterials like graphene and carbon nanotubes, SERB

Selected publication(s) from the Group

- Luo, C-H.; Vijayakumar, P. S.; Yeh, C-S. Nanoparticle biosynthesis using unicellular and subcellular supports. NPG Asia Materials. 2015, 7, e209.
- Verma R. K.; Misra, A. Regulation of cell death by intracellular delivery of nitric oxide to macrophages infected with virulent or avirulent Mycobacterium tuberculosis, Tuberculosis 2015, 95, 625.
- Pandya, S.K.; Verma, R.K.; Khare, P.; Tiwari, B.; Srinivasrao, D.; Dube, A.; Goyal, N.; Misra, A. Supplementation of host response by targeting nitric oxide to the macrophage cytosol is efficacious in the hamster model of visceral leishmaniasis and adds to efficacy of amphotericin B, International Journal for Parasitology: Drugs and Drug Resistance 2016.
- Verma, R. K. Lung Delivery of Anti-microbial Peptides (AMP) Using Dry Powder Inhalable Microspheres for Treatment of Pulmonary Tuberculosis. Respiratory drug delivery 2015, 2, 339.
- Ibrahim, M.; Verma, R.K.; Garcia-Contreras, L. Inhalation drug delivery devices: technology update. Medical Devices: Evidence and Research 2015, 131.
- Mudavath, S.L.; Talat, M; Rai, M.; Srivastava, O.N.; Sundar, S. An oral formulation of Amphotericin B for the treatment of visceral Leishmaniasis: f-Gr-AmB. International Journal of Infectious Diseases 2016, 45, 367.

VI. COMPUTATIONAL NANOSCIENCE



The Computational Nanoscience Group pursues research in disciplines ranging from materials science to bio sciences from the atomic to the nanoscale via a bottom-up approach. The Group envisions gaining a fundamental understanding of properties at an atomic level. It aims at reaching regions which are usually inaccessible in experiments. The Group members conduct research both independently and collaboratively and provides theoretical support to experimentalists, whenever necessary and possible. Key areas are; computational design of nanomaterials for energy storage and conversion, catalysis and gas sensors, organic molecular magnets, and futuristic thermal devices. Besides, research is also carried out in the field of bio-electronics, organic spintronics, electronic charge transfer at nano-bio interfaces, field emission, nanoresonator and solar cell device modeling, ultrasound absorption in nanoparticles for medical applications, and band gap engineering in nanostructures for nanoelectronic and photocatalytic studies. The methods which are employed in the scientific investigations include Density Functional Theory (DFT), Monte Carlo simulations, ab initiomolecular dynamics simulations (CPMD & BOMD), Hybrid Quantum Mechanics/Molecular Mechanics (QM/MM) approach, DFT coupled to non-equilibrium Green's Function (NEGF) and Boltzmann transport equation based models.

Selected publication(s) from the Group

- Gautam, S.; De Sarkar, A., A systematic investigation of acetylene activation and hydracyanation of the activated acetylene on Aun (n = 3-10) clusters via density functional theory. Physical Chemistry Chemical Physics 2016, 18, 13830.
- Dou, K. P.; Fu, X. X.; De Sarkar, A.; Zhang, R. Q., Tailoring the transmission lineshape spectrum of zigzag graphene nanoribbon based heterojunctions via controlling their width and edge protrusions. Nanoscale 2015, 7, 20003.
- Dou, K. P.; Fu, X. X.; De Sarkar, A.; Zhang, R. Q., Dual response of graphene-based ultra-small molecular junctions to defect engineering. Nano Research 2016, 9, 1480.
- Srivastava, A. ; Santhibhushan, B.; Sharma, V.; Kaur, K.; Khan, M. S.; Marathe, M.; De Sarkar, A.; Khan; M. S. Influence of Boron Substitution on Conductance of Pyridine- and Pentane-Based Molecular Single Electron Transistors: First-Principles Analysis. J of Electronic Materials 2016, 1.
- Chmielowski, R.; Péré, D.; Bera, C.; Opahle, I.; Xie, W.; Jacob, S.; Capet, F.; Roussel, P.; Weidenkaff, A.; Madsen, G. K. H.; Dennler, G. Theoretical and experimental investigations of the thermoelectric properties of Bi2S3. J. Appl. Phys. 2015, 117, 125103.
- Madsen, G. K. H.; Katre, A.; Bera, C. Calculating the thermal conductivity of the silicon clathrates using the quasi-harmonic approximation. Phys. Status Solidi A 2015, 213, 802.

VII. STRATEGIC NANOMATERIALS:

The mission of this group is to make strategy for development of new technologies or product (i) especially imported products and (ii) from waste to wealth based on the following themes:

1. Large scale synthesis of valuable materials ongoing in INST under which the group is working towards large scale synthesis of carbon based materials (CNx, Graphene and Carbon nanotube), Silica (for air purification), conductive films of inexpensive materials (copper).
2. Extraction of valuable materials from waste. INST has develop a process to extract high purity nanomaterials (Silica, sodium nitrates, sodium carbonates and sodium chloride) from industrial waste.
3. Materials for energy and food sector: INST has developed a low cost process for production and storage of hydrogen using porous nanostructured materials. The group is also making various preservative for food especially meat products.
4. New materials synthesis and its applications: In this area, we are exploring the new families of materials (Metal chalcogenide, complex metal oxide and metal borides) showing interesting mechanical, superconductivity, ferroelectricity and electron emission properties.

VIII. SENSING AND DIAGNOSTICS

The group aims to design and fabricate suspended graphene based resonator device (i.e NEMS device) that has extremely high sensitivity up to Dalton level (1 in 1021 level high resolution sensitivity). The idea behind the use of graphene as the resonating material is to exploit the extra-ordinarily high elasticity of graphene layers into a THz range resonator and the capacity of graphene to bind with different functional groups as a mass sensor that can sense molecules in the Dalton level. The key idea of sensor comes from the fact that the vibrational frequencies of a resonating structure changes with addition of external mass. This change in frequency will be worked upon to detect and measure the mass of the external particle that adheres to the resonating structure having potential to detect external mass in the range of parts-per-quadrillion (ppq) which is 9-order of magnitude higher than the present detection limit. This technique will be adopted in agriculture for the early detection of pest infestation in crops. In addition, we are also working in the field of piezoelectric device which can be used as pressure sensor for clinical purpose by exploiting the inherent non-centrosymmetric polarization of electrical dipoles against insertion of mechanical force in C3N4 structural units.

The group is involved in developing nanostructured biosensing platforms for clinical and environmental applications and has screened specific aptamers against serum cardiac markers selected from the pool of random-sequence oligonucleotides and demonstrated its usage in a newly developed direct electron transfer based assay format for Myoglobin detection. The sensing platform is capable of detecting Myoglobin in patient's blood sample within a range of 1pg/mL to 16µg/mL in just 100₹, making the system more sensitive and cost-effective than any other commercially available device. Other biosensing platforms have also been developed for public health surveillance targeting bacterial enteric pathogens, prostate cancer management and pesticides monitoring. Growth of multifunctional nanohybrids with ordered porous structures is another area

where we are working on to explore real time applications of mesoporous materials in detecting trace biomarkers in exhaled breathe. Silver impregnated (3 wt%) 3D cubic mesoporous carbon nitride based sensor has been developed exhibiting extremely high sensitivity, super rapid response/recovery time, excellent reversible response, long-term stability and negligible hysteresis compared with previously reported metal oxide based relative humidity sensors. The group also working on Electrochemical/chemical sensor for the preparation of transition metal nanoparticles/conducting polymer decorated graphene and/or N-doped reduced graphene oxide for biosensing of metabolites, DNA biosensing and metal ion sensing.

Ongoing Projects :

1. Low cost Diagnostics for public health surveillance, DST Nano Mission.

Selected publication(s) from the Group

- Kumar, V.; Shorie, M.; Ganguli, A. K.; Sabherwal, P. Biosens Bioelec. 2015, 72, 56.
- Luo, C.H.; Vijayakumar, P. S.; Yeh, C. S. Nanoparticles Biosynthesis by using Unicellular and Subcellular Supports. NPG Asia Materials 2015.
- Shorie, M.; Kumar, V.; Ganguli, A. K.; Sabherwal, P. Current Sci. 2015, 108, 1595.
- Sabherwal, P.; Mutreja, R.; Suri, C. R. Trends in Anal. Chem. 2016, 82, 12.
- Sardana, N.; Talalaev, V.; Heyroth, F.; Schmidt, G.; Bohley, C.; Sprafke, A.; Schilling, J. Localized surface plasmon resonance in the IR regime; Optics Express 2016, 24, 254.

IX. Other Scientific contributors of INST:

Science & Technology, Administration: Coordinator : Shri Mukesh Raja, Sc. B

Administration and Coordination Cell of INST undertakes all science and technology related matters like:

- Research related collaborative projects between INST and other Institutes/Universities.
- Preparation of different Scientific and techno-feasibility reports and their submission to different funding agencies like DST, DBT & CSIR and other grantee institutions. Follow up action for INST activities.
- Nodal point of INST for the Chandigarh Region Innovation and Knowledge Cluster (CRIKC).
- R&D Projects Management
- Preparation of Annual Report of INST.
- Results-Framework Document (RFD).
- Parliament Questions
- Furnishing of inputs on various subject as sought by DST from time to time.

All above Scientific activities and any other miscellaneous work looked after by this cell.

DST Young Scientist: Dr. Sucheta De

Research interest: Thin Film, Optical Coatings, Smart Coatings Optoelectronic Devices, Inorganic Materials and Interface, Solar Cell, Graphene-Silica Heterostructures based Supercapacitor, Graphene-CNT Heterostructure, Polymer based Soft Materials and Renewable Energy.

Highlights of major findings, if any:

- Demonstrated that graphene can be used to enhance the hydrophobicity of nanoporous silica based single layer antireflective coating.
- The inherent anticorrosive property of graphene/nanoporous silica heterostructure can provide long term reliability and repeatability of the device performance against harsh environmental condition.

Wide range of applications eg. in solar panel glass, smart windows, automobiles etc. Cost effective and facile technological development can have a potential for future industrial adoption.

6. RESEARCH PUBLICATIONS

Sr.	Papers Published during the year 2015-16
1	Ghosh, K. ; Verma, Y. K.; Tana, C. S. Implementation of Carbon Nanotube bundles in sub - 5 micron Diameter Through-Silicon-Via structures for Three - Dimensionally Stacked Integrated Circuits. *Materials Today Communications* **2015**, *2*, e16-e25.
2	Baruah, A .; Jha, M .; Kumar, S.; Ganguli, A. K. Enhancement of photocatalytic efficiency using heterostructured SiO2-Ta_2O_5 thin films. *Materials Research Express* **2015**, *2*, 5.
3	Kapil, N. ; Singh, A.; Das, D. Cross -β Amyloid Nanohybrids Loaded With Cytochrome C Exhibit Superactivity in Organic Solvents. *Angew. Chem. Int. Ed.* **2015**, *54*, 6492.
4	Srivastava, A. ; Santhibhushan, B. ; Sharma, V. ; Kaur, K. ; Khan, Md. Shahzad; Marathe, M .; De Sarkar, A.; Khan, Mohd. Shahid. Influence of Boron Substitution on Conductance of Pyridine and Pentane -Based Molecular Single Electron Transistors: First-Principles Analysis. *Journal of Electronic Materials* **2016**, *1*.
5	Kumar, B. ; Saha, S. ; Ojha, K.; Ganguli, A. K. A facil e one step synthesis of Cu/Cu_2O nanocomposites: Enhanced hydrogen/oxygen evolution. *Mater. Res. Bull*. **2015**, *64*, 283.
6	Prakash, B .; Chakraverty, S. Realization of atomically flat steps and terraces like surface of SrTiO 3 (001) single crystal by hot water etching and high temperature annealing. **Solid State Communications 2015**, *213*, 28.
7	Aggarwal, L.; Gaurav, A. ; Thakur, G. S. ; Haque, Z.; Ganguli, A. K.; Sheet, G. Unconventional Superconductivity at Mesoscopic Point-contacts on the 3-Dimensional Dirac Semi-metal Cd_3As_2. *Nature Materials* **2015**, *15*, 32.
8	Luo, C-H.; Vijayakumar, P. S.; Yeh. C -S. Nanoparticle biosynthesis using unicellular and subcellular supports. *NPG Asia Materials* **2015,** *7*, e209.
9	Sharma, S .; Yadav, N .; Chowdhury, P. K.; Ganguli, A. K. Controlling the Microstructure of Reverse Micelles and their Templating Effect on Shaping Nanostructures. *J. Phys. Chem. B* **2015**, *119*, 11295.
10	Thakur, G. S.; Jha, R.; Haque, Z.; Awana, V. P. S.; Gupta, L. C.; Ganguli, A. K. Pressure enhanced superconductivity at 10 K in La doped $EuBiS_2F$. *Superconductor Science and Technology* **2015**, *28*, 115010.
11	Fettkenhauer, C.; Wang, X.; Kailasam, K.; Antonietti, M.; Dontsova, D. Synthesis of efficient photocatalysts for water oxidation and dye degradation reactions using $CoCl_2$ eutectics. *J. Mater. Chem. A* **2015**, *3*, 21227.
12	Das, N.; Nath, M. A.; Thakur, G. S.; Thirumal, M.; Ganguli, A. K. Monoclinically distorted perovskites, A2ZnTiO6 (A= Pr, Gd): Rietveld refinement, and dielectric studies. *J. Solid State Chem*. **2015**, *229*, 97.
13	Haque, Z.; Thakur, G. S .; Ghara, S .; Gupta, L. C.; Sundaresan, A. Ganguli, A. K . Structural and magnetic properties of a new and ordered quaternary alloy MnNiCuSb (SG: F -43m). *Journal of Magnetism and Magnetic Materials* **2016**, *397*, 315.
14	Sharma, M.; Ojha, K.; Ganguly, A.; Ganguli, A. K. Ag_3PO_4 nanoparticle decorated on SiO_2 spheres for efficient visible light photocatalysis. *New J. Chem*. **2015**, *39*, 9242.
15	Selvan, G. K.; Thakur, G. S.; Manikandan, K.; Uwatoko, Y. ; Haque, Z.; Gupta, L. C.; Ganguli, A. K.; Arumugam, S. Upper critical field, critical current density and activation energy of the new $La1-xSmxO_{0.5}F_{0.5}BiS_2$ (x = 0.2, 0.8) superconductors. *Journal of Physical Society of Japan* **2015**, *84*, 124701.
16	Dou, K. P.; Fu, X.; De Sark ar, A. Zhang, R.Q. Tailoring the transmission lineshape spectrum of zigzag graphene nanoribbon based heterojunctions via controlling their width and edge protrusions, *Nanoscale* **2015**, *7*, 20003.
17	Ganguly, A .; Anjaneyulu, O .; Ojha, K.; and Ganguli, A. K. Oxide based nanostructures for photocatalytic an d electrocatalytic applications. *CrystEngComm* **2015**, *17*, 8978.
18	Kumar, V. ; Shorie, M.; Ganguli, A. K. ; Sabherwal. P. Graphene -CNT nanohybrid aptasensor for label free detection of cardiac biomarker myoglobin. *Biosensors and Bioelectronics*, **2015**, *72*, 56.
19	Chmielowski, R.; Péré, D.; Bera, C.; Opahle, I.; Xie, W.; Jacob, S.; Capet, F.; Roussel, P.; Weidenkaff, A .; Madsen, G. K. H.; Dennler, G . Theoretical and experimental investigations of the thermoelec tric properties of Bi_2S_3. *J. Appl. Phys*. **2015,** *117*, 125103.
20	Madsen, G. K. H. ; Katre, A. ; Bera, C . Calculating the thermal conductivity of the silicon clathrates using the quasi - harmonic approximation. *Phys. Status Solidi A* **2015**, *213*, 802.
21	Merschjann, C. ; Tschierlei, S. ; Tyborski, T. ; Kailasam, K.; Orthmann, S. ; Hollmann, D. ; Schedel-Niedrig, T. ; Thomas, A.; Lochbrunner, S. Complementing graphenes: One -dimensional interplanar charge transport in polymeric graphitic carbon nitrides. *Advanced Materials* **2015**, *27*, 7993.
22	Gaganpeet; Srivastasva, S.; Tankeshwar, K. Transport Properties of Colloids in Bulk and in Confinement at Nanoscale, Innovation in nanomaterials, *Nanotechnology science and technology series* **2015**, 169.
23	Indra, A. ; Menezes, P. W. ; Kailasam, K.; Hollmann, D.; Schröder, M. ; Thomas, A. ; Brückner, A.; Driess, M. Nickel as a co -catalyst for the photocatalytic hydrogen evolution on graphitic - carbon nitride (sg -CN): what is the nature of the active species? *Chemical Communications* **2016**, *52*, 104.
24	Kumar, B.; Rao, G. K.; Saha, S.; Ganguli, A. K. Design of Cu based nanocomposites as multifunctional catalysts . *Chem Phys. Chem* **2016,** 17155.
25	Saha, S. ; Ramanujachary, K. V. ; Lofland, S. E. ; Ganguli, A. K. Cu - Co-Ni alloys: An efficient and durable electrocatalyst in acidic media. *Materials Research Express* **2016**, *3*, 16501.
26	Khanchandani, S. ; Kumar, S.; Ganguli, A. K. Comparative Study of TiO_2/CuS Core/Shell and Composite Nanostructures for Efficient Visible -Light Photocatalysis. *ACS Sustain. Chem. Eng*. **2016**, 1487.

7. PROJECTS SANCTIONED

Sr.	TITLE	Funding Agency
7.1 Projects sanctioned in 2013-14		
1	Dynamic Chemical Networks: Minimal Evolving/Self-Replicating Systems with Intelligent Properties by Dibyendu Das	DST-Inspire
2	Biofunctionalized Magnetic Nanocomposites: Glioblastoma Cancer Diagnosis and Therapy by Deepika Sharma	DBT RA
7.2 Projects sanctioned in 2014-15		
1	Development of Versatile, Multifunctional and Adaptable Peptide Nanofiber Scaffolds with Potential for Promoting Neurotigenesis in Brain Injury and Stroke by J. J. Panda	DST-Inspire
2	Smart Gels for Green Energy Applications by Sangita Roy	DST YS
3	First-Row Transition Metals in Catalytic Atom/Group-Transfer Functionalization of Hydrocarbons by Vivek Bagchi	DST YS
4	Self- Assembled nanostrcutures for photocatalytic applications by Sonalika Vaidya	DST YS
5	Smart packing system with the nanocomposite to improve the shelf life of perishable vegetable by P S Vijay Kumar	CARS - DIHAR
6	Metered dose trans-dermal nano-spray herbal gel formulation for rapid relief and effective management of cold injury at extreme altitudes by Rahul K Verma	CARS - DIHAR
7.3 Projects sanctioned in 2015-16		
1	Design of controlled and targeted agricultural pesticide delivery nano-carrier with copper-graphene oxide composite by P S Vijay Kumar	DST Nano Mission
2	Nanostructured Materials Synthesized from Transition Metal by Vivek Bagchi	SERB-EMR
3	Pulmonary delivery of Host Defence Peptides (HDP) using Porous Nanoparticle-Aggregate Particles (PNAPs) for alveolar macrophage targeting in pulmonary tuberculosis by Rahul K Verma	DST-YS
4	Magneto-opto-electronic properties and applications of 2-dimensional electron gas system at oxide interfaces by Suvanker Chakraverty	DST Nano Mission
5	Cell Free Bioreactors from the Shell Proteins of Bacterial Microcompartments by Sharmistha Sinha	SERB-EMR
6	Identification of polycomb and c-Myb signaling and their targeted nanotherapy in leukemogenesis by Subhasree Roy Choudhary	SERB-YS
7	Nanoporous materials for carbon dioxide sequestration by Monika Singh	SERB-YS
8	Towards the development of hybrid supercapacitor-biofuel cell technology and devices by Ramendra S. Dey	DST-Inspire
9	Nanoparticle-mediated inhibition of PRDX2 for selective killing of CHEK2-defective colorectal cancer cells by synthetic lethality by Rehan Khan	SERB-YS
10	Bio-mimicking photocatalytic water oxidation using Manganese and Cobalt oxide nanomaterials: understanding the effect of redox inactive metal ion by Sanyasi B. Naidu	SERB-ECR
7.4 Collaborative projects taken through INST funds		
1	Biological Treatment of engineered nanomaterials -contaminated wastewater-feasibility and implication by Dr S. Vaidya and Dr. S. Sinha	Dr. Arun Kumar, IIT - Delhi
2	Ultra-fast eff ective treatment of Water contaminants using semiconducting nanomaterials to be carried out by Dr. Sonal ika Vaidya and Dr. Monika Singh	Dr. Ganga Ram Chaudhary and Prof. Mehta, PU, Chandigarh

8. INST - INDUSTRY PARTNERSHIP

INST has taken initiatives to address Industrial problems through consultancy, collaboration and industrial projects. This initiative will help INST to apply their scientific knowledge to help industry and come up with the advance technologies which help the growth of value added indigenous products. Following industrial projects are under progress;

1. **Project with C. S. Zircon Pvt. Ltd, Kala Amb, H.P.**
   Stabilization of Yttria doped zirconia (Budget 2.5 Lacs)
   In this project we are working toward synthesis of nanostructured Yttria doped zirconium dioxide (YSZ). The project has been carried out for 6 month and INST demonstrated the possibility of stabilization of YSZ at low temperature.

2. **Project with SRF Ltd, Gurgaon, Haryana.**
   INST has signed the agreement with SRF Ltd for the following two proposal:


Discussion with SRF Ltd. officials with INST's scientists

- Low cost surface modification of textile for prevention of heating during summer : cost 25 lacs, 1 year
- Surface modification for better adhesion property between Rubber and textiles: 30 lacs, 1.5 years
- In these two projects, we are applying nanotechnology based approach to improve textiles, which is one of the highly demanding industrial products. We are also in discussion with the same company for projects on the two themes
- Superhydrophobic Coating on Textile PVC and
- Metal hexaboride coating on textile for cool fabrics.
- Efforts we have tried to make strategy to improve the quality of industrial products and also convert waste into wealth.

3. **Project with Indian Oil Corporation Limited, R&D, Faridabad, Haryana.**
   With IOCL, we are working towards application of nanotechnology for improvement of properties of oil which is the major source of resource generation for IOCL. In this regards, three project proposals are under serious IOCL consideration and writing is under progress. These proposals are:
- Method development for measurement of thermal properties for heat transfer material of nanofluids at higher temperatures
- Functionalization of inorganic oxides for stable dispersion in non-polar hydrocarbon medium.
- Stabilization of metal chalcogenide based lubricants.

4. **Project for societal applications - Water purification**
   INST has developed water purification cartridge for removal of toxic ions. Certain industries have shown interest in working with us either on collaborative basis or on outright transfer of technology. The filter has been tested up to 5 liters highly polluted industrial waste and soon we are targeting 100 liter. We are in discussion with the following two government departments to implement this technology in the states of India.
- Department of Water Supply and Sanitation, Punjab, India
- Medak district, Telangana Govt.
- Patent for the technology has been applied for.

9. COLLABORATIVE PROGRAMS / ASSOCIATION

9.1 Chandigarh Region Innovation and Knowledge Cluster (CRIKC).

Based on the initiative of Prof. Arun Grover, VC, Panjab University, a cluster of Research and educational institutions have joined together at Chandigarh known as Chandigarh Region Innovation and Knowledge Cluster (CRIKC). CRIKC's mission is to foster and sustain close academic alliances between institutions of higher education and research in the Chandigarh region, to facilitate innovation and knowledge creation, achieving excellence in all academic spheres without compromising in any manner the authority of the participating institutions. INST become part of this initiative in 2013 which involves nearly 25 premier research institutions like (PGIMER, CSIO, IMTECH, IISER, NIPER, NABI, TBRL,ISB, PEC, IIT-Ropar, NITTTR, GMCH, INST, BPU) in and around Chandigarh. INST has been identified as the lead player in Nanoscience and technology.

Constitution of Nanoscience group: Under the Chandigarh Region Innovation and Knowledge Cluster (CRIKC), a Nanoscience group club has been formulated headed by Director, INST. The Nanoscience group will bring together related researchers and scientists from all institutes in and around Chandigarh working in the field of nano science and technology under the same umbrella for effective exchange of ideas through discussions and collaborations, Further, this initiative will be a platform to chalk out an action plan to promote, joint projects and facilities for the benefit of researchers in in the tricity area (Chandigarh, Mohali and Panchkula) and nearby places. The INST-CRIKC Science Day was celebrated on 22nd July, 2015(details in section 10.4).

9.2 Association of INST and IISER- Mohali

IISER has been generous to give some laboratory space to INST. IISER has kindly accepted the registration of students for the Ph.D programme and consented to give Hostel to accommodate INST's students, initially (till 2015). Research collaboration between Prof. A. K. Ganguli and Dr. Goutam Sheet on transport and magnetic properties of nano-devices of hetro-superstructure has resulted in two publications. Furthermore, research collaboration between Dr. S.Chakraverty & Dr. A. Venkatesan has proved fruitful.

9.3 Collaboration between INST and Defence Institute of High Altitude Research

Defence Institute of High Altitude Research (DIHAR) – a laboratory of DRDO located at high altitudes of Leh. The laboratory endeavours towards ensuring food, health and energy security of the forces in Ladakh through development of technologies suitable for cold desert regions, formulation of herbal prophylactics and neutraceuticals to improve efficiency in high altitude regions and devising strategies for utilization of non-conventional energy sources. DIHAR is having a similar laboratory at Chandigarh. On the other hand, INST at Mohali is a premier institute of DST mandated to work on aspects of nanoscience and nanotechnology related to agricultural nanotechnology, agricultural sensors, bio-sensors and diagnostics, drug delivery and controlled release, microfluidics based technologies and nanotechnology based solutions for energy and environment. Preliminary discussions between these two organizations have led to identification of following areas of mutual research interest to both the institutes. A Memorandum of Understanding (MoU) has been signed by DIHAR and INST to work collectively mutual research interests to both the institutes. Areas identified are:

- Nano-Packing Materials for improving shelf life of food items (fresh vegetables and meat)
- Sharing of Manpower and Technical Expertise for Collaborative Research
- Formation of Joint Technology Development Council
- Sharing of Research Facilities
- Sharing of IPR Rights in products jointly developed
- Sharing of Authorship in joint research publications.

9.4 A MoU with Post Graduate Institute of Medical Education and Research (ICMR), Chandigarh is in process for nano-diagnostics and therapeutics. INST would conduct basic research related to the areas of diagnostics, drug delivery and therapeutics on the clinical material provided by PGIMER under the collaborative project. The faculty of INST and PGIMER will explore the possibility of jointly seeking funds for conducting collaborative research from Indian and foreign universities/institutions. Joint sponsored and consultancy projects could be undertaken with both long term and short term goals, keeping in view the interests of both the institutes. Usages of facilities at both institutions is also a part of the MoU.

9.5 Collaboration between IIT, Delhi and INST in the area of nanotoxicology: A projects is underway for the collaboration with IIT Delhi and INST on the title of "Biological Treatment of Engineered Nanomaterials-contaminated Wastewater-feasibility and Implications". Another MoU with IIT Delhi nanoscale facility has been initiated.

9.6 Collaboration between INST and Panjab University: A MoU has been signed between INST and Centre for Nanoscience and Technology, Panjab University, Chandigarh to do research work in the application part of Nano Science and Technology. Panjab University, Chandigarh has kindly consented to give some laboratory space to conduct research in the area. A joint collaborative project entitled "Ultra-Fast and Effective Treatment of Water Contaminants Using Semiconducting Nanomaterials" has been taken by INST's Scientists and faculty of Chemistry Department, Panjab University.

9.7 Collaboration with PSCST and INST: Collaboration with PSCST have been also initiated for the dissemination of Science and Technology to the Economic and weaker section of the society. Instituting a lecture in the field of Bio-Science and considered naming the same after the eminent Punjabi Nobel Laureate and Bio-Scientist Prof. Hargobind Khorana by INST.
In this direction, the first lecture under this series, Sir Venkatraman Ramakrishnan delivered the lecture in January 2016.

9.8 Collaboration with Dept. of Higher Education, Govt. of Punjab have been also initiated which resulted in the adoption of three Schools, based on the discussion of Director, INST with Secretary, Higher Education, Govt. of Punjab.

i) Govt. Middle School Sec. 64, Phase-10, Mohali
ii) Govt. Primary School Chilla, Sec. 81, Mohali
iii) Sr. Secondary School Lalru, Mohali

10. Conferences/Special Lectures

10.1. 6th MRS Trilateral Symposium on Advances in Nanomaterials: Energy, Water & Healthcare

The "6th MRS Trilateral Symposium on Advances in Nanomaterials: Energy, Water & Healthcare" during 23-25 November, 2015, was organized by Institute of Nano Science and Technology, Mohali. This was held in Chandigarh, India and given an excellent platform for eminent scientists, academicians, as well as students & young researchers of India, China and Singapore to share their latest discoveries and also providing learning opportunities to young students.

Over last five years this conference was organized at Singapore, Shanghai (China), Mumbai (India), Singapore, and Shenyang (China). This conference aimed to cover the diverse fields of nanoscience and nanotechnology with emphasis on the application of nanotechnology in Energy, Water & Healthcare.

This program was inaugurated by Prof. A. K. Grover, Vice-Chancellor, Panjab University, Chandigarh, Prof. N. Sathyamurthy, Director, IISER, Mohali, Prof. BVR Chowdari, President MRS Singapore and Prof. Ashok K Ganguli, Director INST.

Prof Ganguli, Prof Grover and Prof Chowdari during inauguration

Eminent scientists across the Asia-Oceania countries gathered in the tricity to discuss the advances in technologies and the tremendous science behind the developments in energy, water and healthcare. Distinguished dignitaries including, Prof. Arun Grover, VC of Panjab University, Prof. Sathyamurthy, Director of IISER-Mohali, Prof. Vijayamohanan K. Pillai, Director of CSIR-CECRI-Karaikudi and CSIR-NCL-Pune, Prof. Sarit K. Das, Director of IIT-Ropar, Prof. Arup Kumar Raychaudhuri, Former Director S N Bose National Centre for Basic Sciences, Kolkata, Prof. Manoj Arora, Director of PEC University, Prof. Y. K. Chawla, Director of PGIMER-Chandigarh Prof. Santanu Bhattacharya, Director of IACS-Kolkata, Prof. G. U. Kulkarni, Director of CENS-Bangalore witnessed the scientific events. There were 200 participants in this conference, including approximately 25 invited speakers from India, China and Singapore.

Prof. Ramanujachary, Rowan University

There was a session for short presentation for young scientists from India who have made significant contribution in their research field. An elaborate poster session was also organized where around seventy five students from all over India participated. This poster session was judged by several eminent scientists from India and Singapore and six "best poster" award were given.

The MRS-2015 meeting mostly focused on finding sustainable solutions to issues related to energy, water and healthcare through trilateral collaborations and effective international exchange programs. An interactive poster session in the meeting allowed young participants to interact with the experts on the panel. MRS concluded on 25th November afternoon, which was followed by next scientific meet AISRF-2015. The President of Materials Research Society, Singapore, Prof. B. V. R. Chowdari, announced to have the next meeting in Singapore in 2016.

Poster session and winner of Best prize in Poster

10.2. Second Australia India Strategic Research Fund (AISRF) Meeting on "Advanced Nanomaterials for Energy, Optoelectronics and Biological Applications" organized by Institute of Nano Science and Technology, Mohali

The 2nd Australia India Strategic Research Fund (AISRF) Meeting on "Advanced Nanomaterials for Energy, Optoelectronics and Biological Applications" was organized by Institute of Nano Science and Technology (INST), Mohali during November 25-27, 2015. The inauguration started with the welcome notes of Prof. A. K. Ganguli (Chairperson, AISRF 2015 & Director, INST) and Prof. N Sathyamurthy (Director, IISER Mohali). Prof. Suresh Bhargava (RMIT University, Australia) presented views about the meeting followed by remarks by Prof. Arun K Grover (Vice Chancellor, Panjab University).

Bharat Ratna Prof. CNR Rao delivered the keynote lecture in first session after inauguration chaired by Prof. Arun K Grover (Vice-Chancellor, Panjab University). In his scintillating lecture he talked about inorganic graphene analogues such as MoS2, WS2, GaS and BN. The two and a half days long conference contained one Keynote Lecture and 29 Invited Lectures and a Poster Session.

Prof. CNR Rao inaugurating AISRF and then delivering Keynote Lecture

Eminent speakers form Australia included Prof. Suresh Bhargava, Prof. Ewan Blanch, Prof Andrew S Ball, Dr Charlotte Conn, Prof. Calum Drummond, Dr Oliver A.H. Jones and Prof Srinivasan Madapusi from RMIT

Prof. G U Kulkarni, CeNS, Bangalore and Prof. Bhargava, RMIT University, Australia delivering invited talks at the AISRF meeting

Prof. Andrew S Ball, RMIT Univ., Australia

Poster session during AISRF meeting

University, Australia, Prof. Ken Ghiggino and Dr. David Jones from University of Melbourne and Prof. Chengzhong Yu from University of Queensland. Key Indian Speakers included Prof. D. Bahadur (IIT Bombay), Prof. Ratnamala Chatterjee (IIT-Delhi), Prof. G. U. Kulkarni (CeNS, Bangalore), Prof. B. R. Mehta (IIT Delhi), Prof. S. K. Mehta (Panjab University), Prof. Amitava Patra (IACS), Prof. S Sampath (IISc), Prof. D. D. Sarma (IISc), Prof. K. George Thomas (IISER-TVM), Prof. K. Vijayamohanan (CSIR-CECRI), Prof. Umesh Waghmare (JNCASR), Prof. Ghanshyam Krishna (University of Hyderabad) and Prof. A K Ganguli (Director, INST).

Prof. Bhargava delivered first invited talk on second day of the conference entitled "Midas Touch: Translating Gold Nano-Research into Innovation" where he discussed about how excellence in the gold chemistry was taken from basic discoveries to the real world application. Second invited talk was given by Prof. D. D. Sarma where he discussed about defects in semiconductor nanocrystals which can be an alternative route to photoluminescence. Some other lectures were given by Prof. Ghiggino on "Ultrafast dynamics in organic optoelectronic nanoparticles", Prof. Vijaymohanan K Pillai on "Applications of Graphene for Electrochemical Energy Storage", Prof. Kulkarni on "Highly Decoupled Graphene Multilayers", Prof. Andrew S Ball on "Bioremediation of hydrocarbon impacted environments" and Prof. A K Ganguli on "Nanostructured composites of Molybdenum–based compounds and rGO as electrocatalysts for hydrogen evolution"
Apart from invited talks, a poster session was also conducted in the conference where approx. 50

students/participants presented their research works. Top 6 posters were awarded cash prizes which were sponsored by Punjab State Council for Science and Technology (PSCST). Each of the above carried a certificate and a cash prize.
Finally, Prof. Ganguli extended his thanks and greetings to all participants, delegates, sponsors, organizing committee members and student volunteers for making the event a grand success.

10.3 10th CRSI-RSC Symposium on 4th February, 2016 and 18th CRSI NATIONAL SYMPOSIUM IN CHEMISTRY on 5-7 February, 2016:

Institute of Nano Science and Technology, Mohali in association with Panjab University, Chandigarh organized 18th CRSI National Symposium in Chemistry (NSC-18) from 5th -7th February, 2016 and the 10th CRSI-RSC joint Symposium in Chemistry on 4th February, 2016. CRSI National Symposium in Chemistry (CRSI-NSC) is

Prof. S. Pal with Prof. Dominic Tildesley, President-Royal Society of Chemistry, London

Prof. N. Sathyamurthy, Prof. A.K. Grover, Prof. CNR Rao, Dr. S. Pal, Dr. Mugesh, Prof. S.K.Mehta

Prof. C.N.R Rao during the lecture

a series of highly successful and one of the best attended symposia in chemistry that started in 1999 at IISC, Bangalore.
CRSI National Symposium in Chemistry (CRSI-NSC) is the annual event of "Chemical Research Society of India". It is a series of highly successful and one of the best attended symposia in chemistry that started in 1999 at IISC, Bangalore. The symposium has grown in size over the years, and has attracted over 1000 participants in recent years, thus transforming itself into the most important annual Chemistry Symposium in India.
CRSI-NSC-18 proved itself to be an excellent platform for eminent scientists, academicians, entrepreneurs as well as students & young researchers across the country who shared their latest discoveries and also provided learning opportunities to young students. The first day of the conference was dedicated to the 100th anniversary of electron pair theory of bonding by Prof. G. N. Lewis, the Father of the 'Chemical Bond'. The scientific programme of CRSI-NSC-18 will consist of plenary lectures, various medal lectures, invited lectures, poster presentations and industrial exhibition.
The purpose of this meeting was to provide an excellent forum for the scientists, teachers and students in the country to participate and discuss the recent developments in Chemical Sciences and promote exchange of ideas and create an opportunity for the younger scientists to get exposed to the excitement of research in Chemistry. This National symposium also aims to promote exchange of ideas and create an environment for collaborative endeavors in the emerging frontier interdisciplinary areas. Such interaction could lead to networking, sharing of the knowledge and research collaborations among scientists and young researchers. Over last seventeen years, this conference has grown immensely and has been extremely successful in promoting research in all branches of chemistry.
The scientific programme not only covered all the aspects of chemical research, also include several medal lectures, special lectures along with poster presentations from across the nation and also from abroad. Among the special lectures, C. N. R. Rao Award Lecture was delivered by Prof. J. Paul Attfield from University of Edinburgh, UK, Mizushima - Raman Lecture was given by Prof. Toshiaki Enoki, University of Tokyo, Japan and Animesh Chakravorty Endowment Lecture was delivered by Prof. Shinobu Itoh, Osaka University, Japan.

There were special lectures by CRSI Honorary Fellow, Prof. Henry F. Schaefer, III, from University of Georgia, Athens, USA and Prof. Rene Gree, Université de Rennes 1, France. Besides several CRSI Silver and Bronze medal lectures were delivered by several renowned scientists across the county. The Gold medal award lecture, which is also known as 'Lifetime Achievement Award Lecture' was given by eminent scientist, Prof. K. J. Rao, from Indian Institute of Science, Bangalore.

An overwhelming response has been received from students across the country. Around 600 posters across the country were selected for presentations on the cutting-edge research in different areas of chemical sciences. Around 10 best poster awards were given to the students who showed outstanding performance by both Royal Society of Chemistry and Chemical Research Society of India.

INST hosted Special Lecture:

10.4 CRIKC NANO SCIENCE LECTURE – 22 July 2015: Under the vision of Chandigarh Region Innovation and Knowledge Cluster (CRIKC), INST has also initiated a CRIKC-Nanoscience Group to encourage the interaction and collaborations in order to trigger some new insights and ideas among scientists in the region who are working in the areas of Nano science and Technology. The CRIKC-Nanoscience group organized its first CRIKC-Nanoscience day on 22 July, 2015. The idea behind organizing one day event is to bring together on the same platform practitioners of nanoscience and technology in the scientific institutes at Chanidgarh/Mohali and near neighboring areas to encourage effective exchange of ideas and collaborations; to establish sophisticated research facilities for multi-institutional use; to organize joint conferences, seminars and technical workshops. Prof A.K. Sood, FRS, IISc, Bangalore delivered the first lecture, where he talked about the Rise of Two-dimensional Nanosystems.

10.5 2nd INST-Langmuir Lecture:

The first lecture of this series was delivered by Prof. CNR Rao on March 04, 2014 at Law Auditorium, Panjab University, Chandigarh. The second lecture in this series was delivered by Prof. Steve Granick, Director, Center for Soft and Living Matter, Institute of Basic Science, Daejeon, South Korea and Professor Emeritus, University of Illinois at Urbana-Champaign on 10th October, 2015. Prof Granick talked about "Some Surprises and Open Questions in Soft Matter". A fundamental challenge of modern soft matter physics is to form structure that is not

Prof Granick interacting with audience

frozen in place but instead reconfigures internally driven by energy throughput and adapts to its environment robustly. Predicated on fluorescence imaging at the single-particle level, this talk described quantitative studies of how this can happen. With Janus colloidal clusters, he showed the powerful role of synchronized motion in self-assembly. In living cells, it is found that transportation efficiency problems bear a provocative parallel with polymer chain trajectories with their spatial extent and with jammed matter in their time evolution. A picture emerges in which simple experiments, performed at single-particle and single-molecule resolution, can dissect macroscopic phenomena in ways that surprise.

10.6 Year of Light Lecture Series:

The UN General Assembly in its 68th Session proclaimed 2015 as the International Year of Light and Light-based Technologies (IYL 2015). The idea behind IYL 2015 programs to promote public and political

understanding of the central role of light in the modern world while also celebrating noteworthy anniversaries in 2015 - from the first studies of optics 1,000 years ago to discoveries in optical communications that power the Internet today. In this direction, Institute of Nano Science and Technology, Mohali instituted "Year of Light lecture series".

The Inaugural Year of Light - 2015 lecture was delivered by Prof B.M. Arora, Professor, Department of Electrical Engineering at Indian Institute of Technology, Bombay on Tuesday 8th September, 2015. Prof. Arora delivered two talks, one research talk "Optoelectronics of Solar cells" and other a public lecture on "Electricity from Sunlight: Semiconductor Route" at IISER, Mohali, organized by INST, Mohali.

The second lecture under the Year of light series – II was delivered by Prof. K. Thyagarajan, Professor at Physics Dept. IIT Delhi on Friday, 18th Sept. 2015 at Feynman Lecture Hall, INST- Mohali. Integrated quantum photonics deals with integrated optic devices which use the quantum nature of light for applications in information and communication technologies, quantum simulation, quantum cryptography, etc. Using quantum properties of light it is possible to achieve greater functionalities and realize new devices with great practical applications. Being compact and efficient, it is expected that in the future integrated optic devices will form basic building blocks for complex quantum circuits for various applications.

Prof B.M. Arora during the lecture

Prof Thyagarajan interacting with audience

The talk introduced the quantum properties of light and cover optical waveguides and nonlinear optical effects and how they can be combined to realize interesting devices for integrated quantum photonic applications. Some of our recent work in the design of waveguides and waveguide devices in the field of integrated quantum photonics will also be discussed.

10.7: INST-PSCST Prof. Har Gobind Khorana lecture:

INST in association with Punjab State Council for Science and Technology (PSCST) instituted a lecture in the field of Bio-Science and consider named the same after the eminent Punjabi Nobel Laureate and Bio-Scientist Prof. Har Gobind Khorana. The first lecture under this series was delivered by Sir Venkatraman Ramakrishnan, Nobel Laureate on 05th January 2016 at Panjab University, Chandigarh, where he delivered a lecture on "On Nobody 's Word: Evidence and Modern Sciences". This event was also a part of 3rd DST-INSPIRE Internship camp organized by Panjab University, Chandigarh. The objective of this event was to provide a deeper insight into the realm of science to students and teachers in and around Chandigarh region. More than 800 students & teachers from Punjab have participated this event. The series is proposed to be organized every year under which a Nobel Laureate or an eminent scientist of the similar stature will be invited to interact with students and teachers.

Nobel Laureate Prof. Sir Venkatraman Ramakrishnan addressing the audience during his visit to INST on 05th January, 2016 on the occasion of First Har Gobind Khorana Lecture.

Dr Anurag Kuhad, Coordinator, INSPIRE Programme, PU, Chd, Prof Ashok K Ganguli, Director, INST, Prof A K Grover, VC, Panjab University, Chd, Prof Venkatraman Ramakrishnan, UT Advisor Shri Vijay Kumar Dave and Dr. Neelima Jerath, Exe. Director, PSCST, Chandigarh during inauguration of DST-INSPIRE camp

10.8 Other special talk at INST

1.	Energy Storage Program: Re search on Lithium Ion Batteries, Dr. G. P. Singh, Hitachi Global Storage Technology (Retd.), San Jose, California, USA on 22-3-16
2.	Investigation of nanostructural materials by means of X-ray powder diffraction by Dr. O. Prymak Inorganic Chemistry and CeNIDE, University of Duisburg-Essen, Germany on 26-2-16.
3.	Engineering of Collagen: Vistas in Nano World, Dr. P. Thanikaivelan, CSIR-CLRI, Chennai on 25-2-16
4.	Emergent Orders in Simple Solids, Dr. J. Paul Attfield, University of Edinburgh 9-2-2016
5.	The Use of Recent Developments in Electron Microscopy to Study RIBOSOME Structure, Nobel Laureate Sir V. Ramakrishnan on 6-1-16
6.	Two aspects of dirac fermions, Dr. Sankalpa Ghosh, Department of Physics, IIT- Delhi on 18-12-15
7.	Biosensing by Prof. Vipul Bansal on 15-12-15
8.	Single crystals of superconductors, topological in sulators and magnetic materials, Prof. G. Balakrishnan, Dept. of Physics, University of Warwick, Coventry CV4 7AL, UK on 15-12-15
9.	Investigation of rare-earth doping into ZnO for spintronic applications, Dr. Peter P. Murmu, National Isotope Centre, GNS Science, New Zealand on 10-12-15
10.	Nobel prizes in science (2015), Dr. S. T. Lakshmikumar, NPL, New Delhi on 19-11-2015
11.	Computational nanoparticulate drug delivery, Prof. P.V. Bharatam, NIPER, Mohali on 02-11-15
12.	Environmentally Friendly Organic Synthesis Using Bi(III) & Fe Compounds, Prof. R. Mohan, Dept. of Chemistry, Illinois Wesleyan University, Bloomington, Illinois, USA Mohan on 30-10-15
13.	New insight into pressure-induced phase transformations in Si at nanoscale, Dr. K. Mangalampalli , Dept. of Electronic Materials Engineering, The Australian National University, Canberra, Australia on 31-08-15
14.	Structure-property relationships in nanomaterials, Prof. G. Sankar, Dept. Of Chemistry, UCL on 28-08-15
15.	Nanostructured materials from bi le salts and their applications, Dr. U. Maitra, IISc, Bangalore on 31 - 07-15
16.	Nanoscale Quantitative Magnetic Charact erization of Materials by EMCD & HREELS in a TEM, Dr. R. Datta, International Center for Materials Science, JNCASR, Bangalore on 24-07-15
17.	Organic nano/functional materials, Dr. Abhijit Saha, ETH, Zurich on 23-07-15.
18.	Particle shapes that align in shear flow, Dr. V. Singh, Dep t. Of Chemical Engineering, IIT-Delhi 13-07-15
19.	Probing surfaces and interfaces at the sub-nanoscale in nanostructured materials, Dr. L . Bourgeois, Monash Centre for Electron Microscopy, Monash University, Australia on 18-06-15
20.	Design and development of materials for photocatalytic appli cations and functional coatings, Dr. P Kanhere, NTU, Singapore on 05-06-15
21.	Nano-structured micro -granules by evaporation -induced assembly, Dr. Debasis Sen, Solid State Physics Division, BARC, Mumbai on 03-06-15
22.	Silk-based biomaterials for tissue engg., Dr. S. Ghosh, Dept. of Textile Technology, IIT Delhi on 14-05-15
23.	Transpeptidase Sortase of gram -positive bacteria has turned out be a wonderful tool in synthetic protein chemistry, Dr. R P Roy, NII, New Delhi on 07-05-15
24.	Issues, Challenges & Management of Economy A MES Perspective, Dr. K. N. Banerjee on 6-5-15
25.	Bio-inspired programmable assembly of nanomaterials, Dr. S. Srivastava, CSIO, Chandigarh on 01-05-15
26.	Sustainable Energy Conversion to Organic Reactions, Dr. A. Indra, TU-Berlin, Germany on 24-04-15
27.	Electrochemistry of nano-materials: (Bio) electrochemical systems energy and sensors, Dr. S. Patra, University of Evry, LAMBE, France on 22-04-15
28.	Dynamics of Novel Quantum Phases at Nanostructured Interfaces, Prof. R.C. Budhani, IIT-Kanpur on 06-04-15
29.	Nanoscale investigation on Pseudomonas aeruginosa biofilm formed on porous silicon using AFM, Prof. P. Gautam, Anna University, Chennai on 02-04-15

11. VISITS ABROAD

11.1 Foreign visits of Director, INST
On the invitation of following Universities/ Institutions, Prof. Ashok K Ganguli, Director, INST had visited the following places:

a) Visit of Israel for attending Nano Israel and Joint Symposium from 20th February 2016 to 26 February, 2016.

Prof Ganguli was invited by Prof. Ori Cheshnovsky, Co-Chairperson of the 5th International Nanotechnology Conference and Exhibition (Nano Israel 2016) to participate and deliver a talk in the said conference held in the Smolarz Auditorium, Tel Aviv, Israel, 22-23 February, 2016.

NanoIsrael 2016 was held in cooperation with the Israel National Nanotechnology Initiative (INNI), the Nanotechnology centers at Israeli universities along with the Ministries of Economy and Foreign Affairs and key industry players. NanoIsrael has established itself as the central meeting point for local and multinational companies, investors, university and corporate research scientists and government representatives from around the world.This had several parallel sessions with nearly 50 speakers and nearly 200 posters. There were nearly 1200 attendees. The conference also had several industries of nanotechnology participating and it was very interesting to know how the technology is growing in Israel and other countries.

In addition to this, Prof Ganguli was also invited as part of Indian delegation to participate in Joint Symposium held on 23-25 February, 2016. Prof. Reshef Tenne of Weizmann Institute hosted the Indo-Israel Joint symposium on 25 Feb. 2016.

In this meeting around five Indian delegates and nearly 10 speakers from different universities of Israel along with nearly 60 post docs and PhD students participated. Lectures were on Nanotechnology, multiferroic and superconducting materials. Apart from giving the technical lecture, Director, INST had the pleasant duty of introducing Indian nanoscience scenario and future collaborative opportunities to the Israeli scientists.

(b) France : (October 26 - 27th October, 2015)

As a part of Indian delegation, Prof. Ganguli participated in the 'Indo-French workshop' on Materials Science held at the Université Pierre and Marie Curie, Paris on 26th and 27th October 2015. It was organized by Prof. Ajay Shukla, UPMC, France and Prof. Chandrabhas Narayana from JNCASR, Bangalore, India. This workshop was hosted by the UPMC and financed by the CEFIPRA and Sorbonne Universités.

The Indo-French Workshop on Chemistry and Physics of Materials was supported through CEFIPRA and a very successful meeting of scientists & students of various premier institutes of India and the Sorbonne Universities in University of Pierre and Marie Curie (UPMC), Jussieu Campus, Paris was held on October 27-28, 2015. The Indian delegation was lead by Bharat Ratna, Prof. Rao and the team was Prof. C.N.R. Rao, Prof. Ajay K. Sood, Prof. D.D. Sarma, Prof. G. U. Kulkarni, Prof. Ashok K. Ganguli, Prof. K. George Thomas, Prof. K.S. Narayan, Prof. Chandrabhas Narayana, Dr. Subi J. George and Dr. Kanishka Biswas.

Very high quality lectures were given by all the Indian delegates alongwith equal number of French speakers on various aspects of chemistry and physics of materials including nanomaterials. The deliberations were profound and continued even after the lecture. Many students were also involved from French universities.
UPMC is planning to proceed with furthering the collaboration by having their Masters students to come to India to do part of their studies in these Premier Institutes through a mechanism they have in place. They have also put up funds for faculty visits to these Premier Institutes based on what they saw being presented by the

Indian delegation. The modalities are being worked out. There will be a second workshop in JNCASR, Bangalore in 2016-2017 to help the french researchers and students to see more of science being done in Indian Institutes.

(c) Singapore: (June 28 – 03rd July, 2015)

Prof Ganguli attended the 8th International Conference on Materials for Advanced Technology of the Materials Research Society of Singapore and 16th IUMRS - International Conference in Asia together with 4th Photonics Global Conference 2015 (ICMAT 2015 and IUMRS – ICA 2015) which was held from 28 June to 3 July, 2015 at SUNTEC Singapore. He gave a lecture entitled 'Nanostructured materials based on carbides and nitrides for electrocatalytic applications'.

11.2 Foreign Visits of INST Faculty

a) Visit of Dr. Suvankar Chakraverty, Sc D to Japan:
On the invitation of Institute of Physical and Chemical Research (Riken) Japan, Dr. Suvankar visited Japan as a visiting scientist from 11th till 29th January, 2016. During the said tenure he had worked in Emergent Matter Science center of Riken headquarter at Wakoshi, headed by Prof. Y. Tokura. He worked there on different aspects of thin film and interface technology, by using sophisticated combinatorial pulsed laser molecular beam epitaxy method. He was able to realize several new systems that show emergent phenomena and can be applicable for future generation spin-electronic devices. This visit was very fruitful and will enable strong Indo-Japanese collaboration in future.

b) Visit of Dr. Sharmistha Sinha, Sc D and Dr. Priyanka, Sc-C to Dhaka, Bangladesh:
Dr. Sharmistha Sinha, Sc D and Dr. Priyanka, Sc-C attended 3rd Annual South Asia Biosafety Conference on September 19-20, 2015 held at the BRAC Centre Inn, Dhaka, Bangladesh. The conference provided an opportunity to hear from leading scientists representing regulatory agencies, public sector research institutions, and the private sector in South Asia and internationally. The conference was supported by National Academy of Agricultural Sciences, India, Bangladesh Agricultural Research Council and Department of Environment, Government of Bangladesh. The objective of the conference was to provide an unparalleled opportunity for scientists, regulators and policy makers in South Asia to meet and discuss issues relevant to the risk assessment and regulation of genetically engineered (GE) organisms with a regional focus. The inaugural address was given by Prof. Dr. K.M. Sultanul Aziz, Secretary, Bangladesh Academy of Sciences followed by highlights on the conference objectives by Dr. Andrew F. Roberts Director, Center for Environmental Risk Assessment (CERA), USA.

c) Visit of Dr. Rahul K Verma (Sc C) to France:
With the support of Department of Science and Technology (DST) for Travel and on invitation, Dr. Rahul Verma, Scientist-C, INST attended conference on Respiratory Drug Delivery (RDD) which was held on Europe 2015, Nice France May 5-8-2015 and presented a poster entitled "Lung delivery of anti-microbial peptides (AMP) using dry powder inhalable microspheres for treatment of pulmonary tuberculosis". Peer-reviewed speaker papers and poster abstracts are made available in print or electronically, according to delegate preference, and during the conference via a dedicated conference website. Since, Dr. Verma is also working in the working in the area of respiratory drug delivery systems as preferred route of drug delivery compared with, for example, orals and parenterals for tuberculosis and high altitude pulmonary Edema (HAPE). This conference has explored new tools and technologies as well as best practices and new research strategies to make his research group more productive and competitive and new skills may be developed in this area of research which will be shared with his co-workers and students.

d) Visit of Dr. Rahul K. Verma (Sc. C) to China:

Dr. Verma was also invited as an invited speaker to Inhalation Asia 2015, Pulmonary and Intranasal Drug Delivery Conference, Shenyang, China during September 9-11 2015. He presented a title: Saying NO (Nitric Oxide) to Tuberculosis.

Inhalation Asia 2015 was jointly organized by Inhalation Asia Limited, Hongkong and Shenyang Pharmaceutical University, Shenyang and supported by various renowned Pharma companies like Philips, Pari, Copley etc. This meeting was co-ordinated by Dr. Philippe Rogueda, (Director, Aedestra Ltd, Hong Kong and co-ordinator, Inhalation Asia Limited) and Prof Mao Shui (Shenyang Pharmaceutical University, Shenyang). The conference included approximately 400 participates from 13 countries of Asian continent to present their recent works in the Inhalation and nasal delivery.

Inhalation Asia is a non-commercial conference that aims to provide an opportunity for people who work on pulmonary and intranasal drug delivery in Asia to network and showcase their research, products and services.

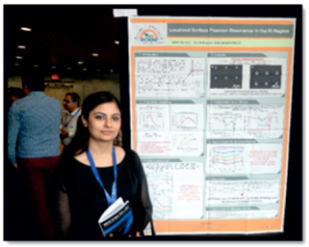
e) Visit of Dr. Manish Singh, Sc. B to Singapore:

On the invitation from Japan Electron Optics Laboratory Limited (JEOL), Dr. Manish Singh visited Singapore to attend JEOL Asia 20th Anniversary seminar on Electron Microscopy during May 20-21, 2015. This seminar was an excellent international platform to meet researchers, scientists and industry representatives who are experts in the field of electron microscopy. The seminar comprised of several interesting lectures highlighting the recent trends in electron microscopy.

Since, Dr. Singh is also working in the area of Electron Microscopy, in order to explore new tools and techniques and new research strategies to improve his skills in the field of electron microscopy.

f) Visit of Dr. Neha Sardana, Sc. B to New York, U.S.A:

Supported by SERB, Department of Science and Technology (DST) for Travel and on invitation, Dr. Neha Sardana, Scientist-B, INST attended conference on META'15, the 6th International Conference on Metamaterials, Photonic Crystals and Plasmonics, being held at City College of New York, New York City, NY, USA, from August 4, 2015 – August 7, 2015. This conference was organized as the United Nations (UN) proclaimed 2015 as the International Year of Light and Light-based Technologies (IYL 2015).



This conference explored new scientific discoveries and technologies as well as best practices and new research strategies in the area of metamaterials, this visit gave an opportunity to learn and interact with other scientists in this field.

g) Visit of Dr. Vivek Bagchi, Sc. B to Singapore:

Dr. Vivek Bagchi has attended 8th International Conference on Materials for Advanced Technologies (ICMAT) and 16th IUMRS – International Conference in Asia was held at Suntec, Singapore during 28th June to 3rd July, 2015. During the said conference Dr. Bagchi delivered a talk entitled "Nanostructured Materials Synthesized from Transition Metal Carbides/Nitrides for Electrocatalytic Applications" in the Materials for Energy symposia. This work explores a special nanohybrid composite material containing molybdenum carbide and nitride nano-particles of 10-15 nm size, which reveals excellent HER catalytic activity.

The six-day long conference had 33 technical symposia covering almost all aspects of Materials Science, Engineering and Technology. 8 plenary lectures and 4 theme lectures by distinguished scientists were presented. A number of keynote and invited lectures in addition to oral and poster presentations were being presented in various symposia from about 2000 delegates. Some of the unique features of the conference included: (i) Organization of the Global Photonics Conference in the form of four different symposia; (ii) Organization of the "Materials in Society Lecture Series" together with the Elsevier Materials Science Council; and (iii) Meet-the-Editors Forum.

12. LECTURES DELIVERED

12.1 Lectures delivered by Prof. A.K. Ganguli

Sr.	Title, Place, Date
1.	'Nanotechnology and sensors', CSIO, Chandigarh (Foundation Day Lecture) 23 April 2015
2.	'Recent developments in Iron pnictides and chalcogenides', (ISCAS), Delhi University 08 May 2015
3.	'Emerging trends in nanotechnology', PEC, Chandigarh, 15 May 2015
4.	'Nanotechnology for energy and environment', IISER, Mohali, 28 May 2015
5.	'Recent developments in pnictide superconductors, IISc Bangalore , 16 June 2015
6.	'Design of nanostructures for energy and environmental applications', Panjab University, Chandigarh 22 July 2015
7.	'Applications of microscopy to nanomaterials', IISER, Mohali , 24 July 2015
8.	'Nanotechnology for energy & environment, CII, Gujarat, Plenary Lecture, 06 August, 2015
9.	'Design of type – II semiconductor het erostructures for efficient visible light absorption and efficient carrier separation', Chemical Frontier – Goa, 15 August 2015
10.	'Imagine life without science, INSPIRE lecture a, PU, 28 August 2015
11.	'Nanotechnology in nature and for the future', MCMDAV College – special lecture, 24 September 2015
12.	'Nanotechnology research and innovation in India', Indo- Belarus workshop at Gurgaon, 16 November,2015
13.	'Design of type – II semiconductor heterostructures for efficient visible light absorption and efficient carrier separation', MRSI Trilateral conference, Mohali 25,November, 2015
14.	'Nanostructured composites of molybdenum based compounds and graphene as electrocatalysts for hydrogen evolution reactions, Indo-Australia meeting, Mohali, 27 November, 2015
15.	'Superconductivity: The Phenomena and Current Status' at JNC-Cambridge Winter School, JNCASR, Bangalore on 08 December 2015
16.	Microfluidic synthesis of semiconductor nanoparticles and their application in water purification by online degradation of dyes, ICANN –IIT Guwahati, 10 December 2015
17.	Design of nanostructures for energy and environment, GITAM University, 14 December 2015
18.	'Nanotechnology based devices Made in India for applications in water purification, energy and healthcare' at 103rd Indian Science Congress, University of Mysore on 04 January 2016
19.	'Imagine life without Science' at Inspire Lecture, PU on 06 January 2016
20.	'Design of visible light active nanostructures ' at BARC-International Photochemistry Meeting at BARC, Mumbai on 07 January 2016
21.	'Nanotechnology in Nature and for the future' at Jigyasa – 2016, IIT _ BHU on 10 January 2016
22	'Imagine life without Science' Inspire Lecture Gwalior on 20 January, 2016
23.	'Structural Aspects of Superconductors' at Workshop on Solid State & Materials Chemistry, INST, Mohali on 8 February 2016
24.	'Nanotechnology and Bioprocessing' at CIAB, Mohali on 11 February, 2016
25.	'Design of nanostructures for energy & environmental applications' at Nanoscience tech at PU on 18 February, 2016.
26.	'Nanotechnology and its applications in energy, environment and healthcare ' at Maitreyi College, Delhi on 20 Feb 2016.

27.	'Design of nanostructures for energy & environmental applications ' at University of Delhi on 27 February, 2016.
28.	'Nanotechnology based applications for water purification, energy and healthcare' at Bengal Science Congress, Jadavpur University, Kolkata on 29 Feb 2016
29.	'Design of visible light active core - shell nanostructures' at ICONSAT-2016, IISER Pune on 1 March, 2016 .
30.	'Superconducting Materials' at Science Academies Workshop, GNDU, Amritsar at March 5, 2016
31.	'Design of nanostructures for energy & environmental applications' at Hyderabad on 4 March 2016
32.	'Development of low cost sensors & Devices ' at INST at Central University of Gujarat on 11 March, 2016.
33.	'Characterization Techniques : X -ray diffraction, light scattering and electron microscopy'at Workshop at SAIF, PU, Chandigarh on March 15, 2016.
34.	'Nanoscience & Nanotechnology' at B R Ambedkar Marathwada University, Aurangabad on 17 March 2016.
35.	'Superconducting and Magnetic Properties Of BiS_2 – based layered materials' at Indo-Japan Meeting, SSCU, IISc Bangalore on 30 March 2016.

International:

- Nanostructured composites of molybdenum based compounds and graphene for electrocatalytic applications, Université Pierre and Marie Curie, Paris 26th -27th October 2015.
- Development of low cost sensors & Devices at INST, Indo – Israel meeting, Weizmann Institute of Science, Rehovot, Israel on 25.2.2016.
- Design of nanostructures for energy & environmental applications, 5th International Nanotechnology Conference and Exhibition (Nano Israel 2016), 22-23 February, 2016.
- 'Nanostructured materials based on carbides and nitrides for electrocatalytic applications', ICMAT Singapore, 01 July, 2015.

12.2 Lectures delivered by INST's faculty:

Conferences / Workshops attended by INST Faculty:

Name of Faculty/Title/Place/Date
Dr. Abir De Sarkar, Scientist-E
➢ Presented invited talk at the International Workshop on Computational Condensed Matter Physics held in IIITM, Gwalior between 18-22 October, 2015
Dr. Asish Pal, Scientist- E
➢ Special Annual Lecture for M-Tech students and faculty at CNSNT, Panjab University, India ➢ Special Lecture at Chemistry Dept. at Guwahati University, Assam

Dr. Kamalakanan Kailasam, Scientist-E
➢ Invited talk at 4th International Conference on Hydrogen and Fuel Cell at Agra during December 6 - 8, 2015 on "Porous Organic Materials based on Carbon Nitrides for Hydrogen Generation and Storage Applications". ➢ Invited talk at National Conference on Nanotechnology in Agriculture, Energy and Medicine at Central University of Gujarat, Gandhinagar during 11th and 12th March 2016 on "Versatility of Carbon Nitride Nanostructures in Energy Applications". ➢ Invited talk at National Institute of Technical Teachers Training & Research (NITTTR), Chandigarh on 19th November 2015 on "Nanomaterials for Energy and Environment".
Dr. Surajit Karmakar, Scientist-E
➢ Karmakar S (2016). Effect of Silica Nanoparticles Surface Functionality on Cellular Uptake and Cytotoxicity of Curcumin. National Conference on Nanotechnology in Agriculture, Energy and Medicine held on 11 th and 12 th March 2016 at Central University of Gujarat, Gujarat, 12 th March, 2016.
Dr. Jayamurugan Govindaswamy, Scientist-D
➢ Delivered a talk entitled "Impact of Polymer Science in Daily Life: Past, Pr esent, and Future" in the workshop, which was organized by INST on 27th February 2016 to celebrate the National Science day
Dr. Kaushik Ghosh, Scientist-D
➢ Delivered an Invited talk on "Nanostructure: From Device to Interconnect" in ICANN conference at IIT Guwahati. ➢ Delivered an Invited talk on "Anticorrosive and antireflective solar glass" in ICMTech on 1st - 4th March at Delhi University and co-chaired two sessions. ➢ Delivered an invited talk on "Carbonaceous Material based Flexible Supercapacitor" in Australia - India Strategic Research Fund (AISRF-2015) workshop 25th to 27th November.
Dr. Suvankar Chakraverty, Scientist-D
➢ Indo-Japan 2016 Emergent phenomena in transition - metal compounds and related materials at IISc Bangalore.
Dr. Jiban Jyoti Panda, Scientist-C
➢ Science academies Lecture workshop: on Emerging Technology based on Nanoscience, A Popularization Workshop" at Mody University, Rajasthan, 22-23 April ➢ Nanotechnology in Cancer Diagnosis and Therapy: Bright Future Lies Ahead, Peptide Based Self - assembled Nanostructures: From Models to Application
Dr. Rahul Kumar Verma, Scientist-C
➢ Delivered a lecture on the title "Saying NO (Nitric Oxide) to Tuberculosis" Inhalation Asia 2015, Pulmonary and Intranasal Drug Delivery Conference, Shenyang, China, September 9, 2015. ➢ Presented a poster entitled " Lung delivery of anti - microbial peptides (AMP) using dry powder inhalable microspheres for treatment of pulmonary tuberculosis" during Respiratory Drug Delivery (RDD) Europe 2015 conference, held at Nice, France during May 5-8 2015.

Dr. Tapasi Sen, Scientist-C
➢ Delivered an Invited talk entitled " Gold nanoparticle based assemblies for energy applications" in National conference on "Frontiers in Light-Matter Interaction" (FILMI 2016) during March 4-5, 2016 held at IIT Ropar.
Dr. Aifkhan Shanavas,Scientist-B
➢ Invited talk at ICMR sponsored National Conference on Nanotechnology in Drug Delivery Research: Innovations, Challenges and Opportunities, 2015, SPPSPTM, NMIMS, Mumbai.
Dr. Chandan Bera, Scientist-B
➢ Lecture on Magnetic Nanoparticles as an Efficient heat mediators for tumour therapy" in GLOBAL CANCER SUMMIT 20 15 held at Indian Institute of Science Bengaluru, India during November 18-20, 2015
Dr. Neha Sardana, Scientist-B
➢ Invited talk titled " Raman Spectroscopy" at Instrumental Techniques for Chemical and Material Analysis (ITCMA -2015), Applied Sciences Dept., Dec 21-25, PEC University of technology 2015. ➢ Invited talk at Frontiers in Light-Matter Interaction, Dept. of Physics, March 4-5, IIT Ropar 2016, titled: Nano porous gold as a plasmonic metamaterials.
Dr. Ramendra Sundar Dey, Scientist-B
➢ Lecture on Three-dimensional graphene based binder-free supercapacitor at ICMTECH 2016, 1-4 March, 2016, University of Delhi, Delhi.

13. PARTICIPATION OF INST IN VARIOUS EVENTS

a) Participation of INST, Mohali in India International Science Festival (IISF 2015) held at IIT, Delhi – during December 04-08, 2015

India International Science Festival (IISF 2015), a joint event of Ministry of Science and Technology and Ministry of Earth Sciences, was organized by Technology Information, Forecasting and Assessment Council (TIFAC) in collaboration with Vijnana Bharati (VIBHA) during December 04-08, 2015 at Indian Institute of Technology (IIT) Delhi. The festival aims to provide a platform to young scientists from all over the country to share and spread their scientific ideas, achievements and inventions.
INST, Mohali has actively participated in Mega India International Science Festival (IISF 2015) expo and showcased four technologies on low cost water purification, silicon based supercapacitor, graphene biosensor, and bolometer. INST has also introduced the viewers with our outreach program. The Hon'ble Minister for Science & Technology and Earth Sciences, Dr. Harsh Vardhan and several other dignitaries, visited the INST pavilion and showed special interest in technologies being developed at INST ; low cost water purification device that involves the use of novel nanomaterials for the purification and recycling of industrial as well as domestic waste-water.

b) Participation of INST in DST Autonomous Body Conclave (ABC) held at Hyderabad:

A conclave of Autonomous Institutes of DST was organized by ARCI Hyderabad on 05-07 July 2015 at Hyderabad under the Chairmanship of Hon'ble Minister for Science & Technology and Earth Sciences Dr. Harsh Vardhan. There was active participation of all autonomous institutions and Professional bodies under DST. INST also participated in the said event. Prof. Ashok K Ganguli, Director, INST presented the progress made by the Institute and gave an overview on the different research activities carried out by the scientists by presenting the key points focusing on the major thrust areas like agriculture, nanotechnology, Sensors, Medical nanotechnology, Nanotechnology based solutions for Energy and Environment. INST's association with National Societal Programme like Swachh Bharat Abhiyan, Swasth Bharat, Make in India etc. were also highlighted.
The Hon'ble Minister and other experts noted above activities and complimented the Director, INST for making rapid advances in research and their impact on society in a very short span of 2 and half years.

c) Participation of INST's in 103rd Indian Science Congress held at University of Mysore, Karnataka :

The 103rd Indian Science Congress was held at University of Mysore, Mysuru, Karnataka from 03 to 07 January 2016. This prestigious event was inaugurated by the Hon'ble Prime Minister, Shri Narendra Modi. Along with the main conference, an exhibition "Pride of India" was also organized, where various Government Organizations and Institutions had showcased their innovations in science and technology.

A team of scientists and students of INST participated this event and showcased the innovations pursued by the INST in the field of Nanoscience. Low cost conducting nano-ink, anti-reflecting coating for solar panels, lab-on-chip biosensors, flexible non-cryogenic bolometer sensor etc. are among the prototypes which were demonstrated by INST-team at the Expo. Apart from the prototype demonstration INST had also showcased its ongoing research activities in various steams of Nanoscience. Director, INST, Prof. A. K. Ganguli delivered a talk in the main session devoted to Nanotechnology, chaired by Prof. A K Sood, IISc, Bangalore, where scientific activities and the current innovations of INST were showcased. Apart from scientific activities, INST-team had also reached out to school students and teachers to connect them with INST's ongoing Outreach program.

14. AWARDS AND HONORS

INST Research Scholar Mr. Munish Shorie received the Best Poster Award at Bangalore Nano conference held at Bangalore on March 4, 2016.

Young Scientist Award to Dr. Menaka Jha, Scientist-B, INST given by given by Prof. Sourav Pal, President, Chemical Research Society of India (CRSI) on February 7,2016.

(a) Best Poster Award to Dr. Menaka Jha, for displaying best water purification technology during Confederation of Indian Industry conference - GiGaNTic-2015, Ahmadabad, Aug 4-7, 2015.

(b) Postdoctoral Fellow, Dr. Seema Gautam was awarded the Best Paper for her oral presentation at the International Workshop on Computational Condensed Matter Physics held in IIITM, Gwalior in 18-22 October, 2015

(c) Ramanujan Fellowship Awarded by DST-SERB to Dr. Jayamurugan Govindaswamy, Scientist-D, INST.

(d) Dr. Sucheta De, DST Young Scientists was awarded 'Excellent Poster Presentation' in the '5th International Science Conference' held at the Dr. Ram Manohar Lohia Hospital, New Delhi during 10-12th October, 2015 organized by World Science Congress.

(e) Mr Sandeep Vashishth Poster award "Australia-India strategic Research fund meeting- 2015 on "Advanced Nanomaterials for Energy, Optoelectronics and Biological applications", held during 25th- 27th November, 2015 organized by INST, Mohali.

(f) Munish Shorie received "Ruchi Ram Sahni" best poster award in biological category, CRIKC nanoscience day.

Mr. Ashmeet Singh from INST has received Best poster Award at CRSI-2016, given by Prof. Sourav Pal, President, CRSI

(g) Munish Shorie received Best poster award at 6th MRS trilateral symposium on advances in nanomaterials: Energy, Water and Healthcare, Nov 2015.

(h) Harmanjit Kaur was awarded with best poster in designing posters for the Har Gobind Khorana exhibition pavilion in INST foundation day, March 2015

(i) Munish Shorie got the best poster award during CRSI-2016, March 2016.

15. OTHER IMPORTANT ACTIVITIES

Dr. Harsh Vardhan, Hon'ble Union Minister of Science & Technology and Earth Sciences, being welcomed by Prof. Ganguli, Director-INST

The Hon'ble Union Minister looking at the microfluidic channels developed in INST through the optical microscope

15.1 Visit of Hon'ble Minister for Science & Technology and Earth Sciences, GoI on 19th October 2015:

During the visit, the Hon'ble Minister was briefed about the general overview of the institute by the Director (Prof. A. K Ganguli) where all the scientists and students were present. Dr. Priyanka, Scientist-C, INST presented the institute's research activities in detail. She gave an overview on the different research activities carried out by the scientists by presenting the key results like biosensors for detecting the cardiac arrest, hydrophobic graphene-silica composites as anti-reflective coating, new superconductor materials, nanosorbent based water purification systems, etc. The publications from the institute, various CRIKC initiatives, projects sanctioned by various funding agencies and lecture series of INST were also pointed out. Dr. M. Jha, Scientist-B, INST briefed about various technological developments and their outcomes being carried out in the institute. She pointed out the industrial cooperation of INST with i) Indian Oil Corporation ii) Luminous batteries iii) Philips India and iv) Zircon Industries. After that Dr. Deepika Sharma, Scientist-B, INST briefed about INST's societal programme – Outreach and various outreach activities carried out all over India for the school students to create awareness about the science explaining how they make our lives better. She explained that students were taught about the importance of nanotechnology and which kindles their interest by demonstrating some experiments.

The Hon'ble Minister also visited INST's Faraday lab where all the group coordinators explained their projects being carried out in different disciplines and was also shown technologies being developed in INST. Some experiments were also demonstrated, notably, biosensors, bolometric sensors, nanosorbent based water purification setup and hydrophobic antireflective coatings. The Hon'ble Minster was also shown the instrumental facilities of INST. The Minister was also informed of number of research papers from faculty of INST published in highly reputed journals like Nature Materials, Angewandte Chemie, Chem Comm and others.

After the above presentation from the scientists of INST and visit to Faraday Laboratory, the Hon'ble Minister lauded the various research activities being performed in INST. He insisted that the scientists of the institute not only should focus on publishing their research results but also develop technologies using nanotechnology to serve the mankind. The Minister was fascinated to see the progress made by an upcoming institute within a very short span of two and half years since its setting up in January 2013.

He was happy to note that the Institute was making progress in exploring new field and generating innovative ideas using its bright faculty. He was particularly delighted to note that apart from conducting research, academic and developmental activities, the institute's involvement in a social welfare programme of providing education to the younger generation of the nation that to from rural and remote areas through its Outreach programme. He particularly lauded this programme which he felt would inculcate the practice to develop technology in India amongst young generation studying in schools. The Minister was also fascinated by INST's association with the National Societal Programme like Swachh Bharat Abhiyan, Swasth Bharat, Make in India etc. He expected the institute to excel through the use of Nano Science and Nanotechnology in its major thrust areas like agriculture, nanotechnology, Sensors, Medical nanotechnology, Nanotechnology based solutions for Energy and Environment.

The Minister urged the scientists to keep-up the good work they were doing in the above areas and wished the faculty to prosper as an individual by addressing the basic needs of the people. He suggested the scientists to take up the challenges facing the people of India and work towards a solution to provide comfortable life. While seeing the demonstration, the Minister interacted with the faculty to know in detail about the progress of some of the work areas, e.g., clinical trials in nanomedicine.

Finally, the Minister also was taken to the new INST campus site at Sector 81, Mohali. He was briefed about the new INST campus plan at the site. He also planted a tree in the new campus and wished all success to INST in its new campus development programme and hoped for a state-of-the-art building to come up.

Dr. Priyanka presenting the Institute's research activities and key milestones achieved by the scientists of INST, Mohali

The Hon'ble Union Minister performing the tree plantation at the INST new campus site

15.2. Celebration of National Technology Day on May 12, 2015:

National Technology Day is celebrated every year on May 11 to commemorate the history of India's innovation and excellence in Technology. The day holds significance as India successfully tested nuclear bombs in Pokhran, Rajasthan on May 11, 1998. To mark this occasion, INST also celebrated this day by organizing series of lectures on technology related areas followed by quiz competition. Dr. Menaka Jha, Scientist-B of INST highlighted the various initiatives going on technology development in INST under the title "Latest technologies developed in INST". It was followed by a talk from INST Post-doctoral fellow, Dr. V. Ramana Gedela on "Market Strategy for Graphene based technologies", where he explained the industrial perspective on graphene materials in India. Mr. Munish Shourie, PhD student of INST delivered a talk on "Recent trends in Nanotechnology for Point of Care Diagnostics", where he described the point-of-care diagnostics tools in market along with the technology developed in his group in detail. After that, quiz competition was held for PhD and intern students on recent technologies developed in India.

15.3 Celebration of Hindi Pakhwara:

INST celebrated Hindi Pakhwara during September 14-28, 2015. INST promotes doing official work in Hindi. Director encouraged faculty members to promote Science especially Nano Science and Technology in Hindi. In this direction, faculty of INST's are delivering Outreach lectures in Hindi in different parts of Punjab, Haryana, Himachal Pradesh and Delhi. During the Hindi Pakhwara, competitions were organized like Anuvaad (Hindi to English and English to Hindi), Shabdavali (Hindi to English and English to Hindi), Aadhikarik Patra Lekhan, Nibandh Lekhan, Kaavya path. The winners of these competitions were felicitated by Dr. R. S. Tuli, former Executive Director, NABI, Mohali.

15.4 Celebration of National Youth Day:

Celebration of Birth anniversary of Swami Vivekananda: (National Youth Day, 15th January, 2016): National Youth Day (Yuva Diwas or Swami Vivekananda Birthday) was celebrated with the great joy and enthusiasm in INST on 12th of January, 2016. It is celebrated to commemorate the birthday of Swami Vivekananda, maker of the modern India. Prof Ganguli, Director, INST quoting the philosophy of Swamiji and the ideas for which he lived and worked could be a great source of inspiration for the Indian youth.

15.5 Celebration of Birth Anniversary of Dr. APJ Abdul Kalam :

As a mark of respect to the former President and Missile man of India Bharat Ratna, APJ Abdul Kalam's 84th birth anniversary was celebrated with great enthusiasm at Institute of Nano Science and Technology (INST) on INST campus on 15th October 2015. The program was attended by INST scientists, staff and 28 students from two schools from Mohali region namely Government middle school, Phase-10, Mohali, and Government Senior Sec. School Phase-3B1, Mohali.

"Kalam-An Inspiring Icon" – a beautiful documentary short film which was designed by Dr Vivek Bagchi, Scientist-B, INST was shown on the events of life and focusing on the achievements of the great scientist.
The second session of the event after high tea break involved visit of the students to the picture gallery on the chronological phase of life-events of Dr Kalam which was designed and coordinated by Dr Rahul K Verma, Sc-C, INST.
Further, Students participated whole heartedly in the quiz coordinated by Dr Neha Sardana (Sc-B, INST) covering various aspects of Kalam's personality.
At the end of the programme, each participating student was awarded with a certificate and awards by the Chief Administrative and Finance officer, Shri UC Prasad. The teachers were also awarded by a book "Wings of Fire" written by Dr. Kalam.

15.6 Celebration of Annual Sports Day:

The Recreation and Sports Club of INST organized two-day sports events on 12-13 February, 2016 as annual sports day of the institute. The following sports events were organized: Badminton (Singles, Doubles and Mix-Doubles), Table Tennis, Cricket, Racing and Tug of War. INST's faculty, staff and students participated in this events with great enthusiasm.

SPORTS	Women	Men
BADMINTON	***Doubles:*** **Winners:** Astha Singh and Rashmi Jain **Runners Up:** Guratinder Kaur and Jiban J. Panda	***Doubles:*** **Winners:** Arabinda Baruah and Soumen Ash **Runners Up:** K. Kailasam & Asish Pal **Singles:** **Winner:** Arabinda Baruah, **Runners Up:** U. C. Prasad
RACING (100M)	**Winners:** Subhashree, Harsimran & Suman	**Winners:** Navbhar, Mujeeb, Rajinder **Special:** U. C. Prasad, P. K. Datta, Surajit
TABLE TENNIS	**Winners:** Sucheta De and Sunaina	**Winners:** U. C. Prasad and Anirban Kundu **Runners Up:** Ankur Sharma and Kalpesh Vaghasiya
TUG OF WAR	**Winner:** A. K Ganguli and Team (Naidu, Soumen, Ankur, Dinesh, Jayamurgan, Harman, Ravi, Palwinder)	
CRICKET	**Winner:** Ashmeet Singh (Captain), Kaushik, Abir , J ayamurgan, Praveen, Anirban, Soumen, Krishna, Amit & Arabinda. **Runners Up:** Suvankar Chakraverty (Captain) , Navbhar , Pulkit, Nityasagar, Anup, Saurabh & Bhagyesh	

15.7 Foundation Day of INST, Mohali:

Institute of Nano Science and Technology, Mohali celebrated 3rd Foundation day on 2nd March, 2016. Prof. A. K Grover, Vice Chancellor, Panjab University, gave the Foundation day lecture on "Institutions of Higher Learning and Research, National Development Initiatives and Innovation Ecosystem: A Historical Perspective". Many eminent professor from neighboring institutes and faculty, students from CRIKCs institute attended the program, along with scientist and students of INST at ISB Mohali auditorium. INST distributed sports awards of the institute after the Foundation day lecture. A cultural evening organized by INST students and scientist followed the Foundation day lecture. The cultural evening was attended by all the distinguished guests.

Prof Ganguli, Director, INST addressing the audience and Felicitation of Prof Grover, VC, Panjab University, Chandigarh after his invited talk.

Cultural programme on the Foundation Day in progress: Felicitation of Dr. Subhashree – INST Faculty by Prof Sathyamurthy, Director-IISER, Mohali

15.8 Celebration of International Women's Day on 08th March, 2016:

INST celebrated International Women's day on 8th March, 2016. The event began with the address of chief guest Dr. Neelima Jerath (Executive Director, PCST). Various examples were quoted to sensitize the audience about women related issues. Dr. Sunita Mishra (CSIO, Chandigarh) delivered an invited talk on women related laws for their empowerment. Another vibrant talk by Dr. Sharmistha Sinha (INST, Mohali) inspired audience, when she shared her own experience towards balance in personal and professional life. Our Ph.D. students presented poems, slogans, skits to create awareness about gender bias, importance of literacy for women and many other societal issues. More than eighty people including Ph.D. students, post doc fellows, Scientists and the faculty from INST as well as from CRIKC region were present during the event. This attempt to organise the first International women's day celebration at INST was appreciated by everybody.

16. OUTREACH PROGRAMME


Institute of Nano Science and Technology (INST) Mohali has taken a step forward by introducing an outreach programme especially for rural, remote and under-served schools with the objective to promote science and technology among young generation of the nation. Through this programme, we hope to spark the interest of the future generation of scientists and engineers upon whom the nation would be critically dependent.

INST has also initiated Chhatra Protsahan Vyakhyan Shrankhla (CPVS- INST) outreach programme in May 2015 and North East Educational Development (NEED)-INST in October 2015 specifically for the North Eastern states.

As a part of outreach programmes during the last two year, INST has covered around 150 schools in rural/remote areas in the state/UT of Uttarakhand, Punjab, Himachal Pradesh, Uttar Pradesh, Chandigarh, Tamil Nadu, Kerala, Assam and Meghalaya.

Under the outreach programme, INST organizes in-house programmes with the aim of motivating students for science education. INST's goal is to encourage students to develop a genuine interest and stronger skills in science. As part of the in-house programmes, meritorious students are invited to INST. Typically, interactive sessions are arranged in which eminent academics in the region are invited to deliver lectures which are followed by visits to research laboratories and demonstration of experiments. Career guidance sessions are also arranged as part of the programme. We believe that this would be a captivating experience for young students. All Scientists of INST along with the Director, Prof. Ashok K. Ganguli actively participate in such programs.

16.1. 1st In-House Outreach Workshop @ INST:

The '1st in-house workshop @ INST' was organized on 26th May, 2015. The workshop was attended by around 80 meritorious students from schools in Mohali and Chandigarh. As part of this workshop, Prof. Amlan K. Das (Mody University, Sikar, Rajasthan) and Ms. Snighda Das (Vidya Bhawan Society, Udaipur, a teaching aids and grass root teacher trainer) [both were originally associated for several years in the Hoshangabad Science Teaching Programme (HSTP), which has made science fun for nearly 40,000 middle school students in Madhya Pradesh] demonstrated scientific experiments to students in such a way as to stimulate their scientific thinking. A visit to Faraday lab was arranged subsequent to the demonstration. During the lab visit, students were shown various state-of-the-art instruments that are used for nanomaterial characterization.


Demonstration by Prof. A. K. Das and Ms. S. Das at INST.

16.2. Motivational Contact Program for Talented School Students

INST in association with Punjab State Council for Science and Technology (PSCST) organized the 'Motivational Contact Programme for Talented School Students of Punjab from August 10 to 14, 2015 at INST, Mohali. Around 30 meritorious students who passed class 10th from Punjab School Education Board/Central Board of Secondary Education, and currently in the science stream attended the program. The inaugural ceremony of the programme was attended by honourable guests Prof. N. Sathyamurthy, Director, IISER Mohali, Shri Dharam Vir, IAS, State Election Commissioner and Chief Secretary (Retired), Government of Haryana, and Prof. Ashok K. Ganguli, Director, INST. Honorable guests interacted with the students with thoughts on how they made it to the highest position in their chosen profession.

Prof. Arvind, IISER Mohali delivering a lecture as part of the 'Motivational Contact Program for Talented School Students'. Faraday lab visit by the participants.

The motivational programme was conducted over a period of five days and consisted of a series of lectures by eminent academics from different institutions in and around Mohali. Visits to Faraday and INST-IISER laboratories were also arranged wherein students were shown how to synthesize and characterize nanomaterials for various applications. A one-day visit to Pushpa Gujral Science City, Kapurthala (Punjab) was also arranged as part of the programme. A similar programme was organized on 3rd November, 2016 by INST in association with Punjab State Council for Science and Technology (PSCST) and National Agri - Food Biotechnology Institute (NABI), Mohali. In this context, a series of lectures was organized along with a visit to the Faraday lab. The programme was attended by around 30 students who passed class 10th from Punjab School Education Board/Central Board of Secondary Education.

16.3. Nano for Children 2015: Workshop for Budding Scientists

As a part of outreach programme, INST (Sector 64, Mohali) celebrated the annual programme "Nano for Children" in INST campus on 20th November 2015, in which our scientists imparted basic knowledge & awareness of some amazing new development in science to young minds through lectures and workshop. This

workshop was organized with an objective to get science out of the textbook and help to develop a genuine interest and stronger skills in science among students. Through this programme, INST hopes to spark the interest of science and technology in future generation, upon whom the nation would be critically dependent.

The workshop was attended by a total of 32 students from different schools along with one accompanying teacher, from the areas adjoining Mohali. Following schools from Chandigarh and Mohali region participated in this event i: e. Carmel Convent, Sector 9B, Chandigarh, Govt. model Senior Sec School, Sector-37D, Chandigarh, Govt. Senior Sec School Phase-3B1, Mohali.
After the keynote address, a special lecture was delivered by Shri Sidharth Chattopadhayay, IPS, Additional Director General of Police (ADGP) Punjab police, Chief Guest of the event. Shri Chattopadhayay encouraged school children to set their life goal with self reinforcement show intensity, enthusiasm, interest and minimize anxiety. He taught that successes and failures are attributed to controllable effort and ability, and inspired students to strive for excellence & success. At the end of the programme, each participating student was awarded with a certificate by the Director. The teachers were also awarded for their efforts.

16.4 Road show organized by INST-Mohali to promote science in daily life:

Institute of Nano Science & Technology (INST) organized a roadshow on 3rd February at Sector 17, Plaza area as a satellite event ushering the 18th Chemical Research Society of India (CRSI) meeting, "National Symposium in Chemistry (NSC-18)" to be held during 5th -7th February. The purpose of this event was to foster scientific temperament among the common people. INST's students with the help of the scientists demonstrated simple yet very useful experiments to promote the scientific awareness in general public. A large number of enthusiastic school and college students also visited the roadshow and keenly followed the experiments displayed by the leading scientists from Tricity area. Prof. Ashok K. Ganguli, Director-INST said "the event is first of its kind in India, where top level scientists interact with the general public and explain the role of chemistry in daily life". Many distinguished scientists from India and abroad graced the occasion and hailed the initiative. Some of them include Bharat Ratna Prof. C. N. R. Rao, Prof. Sourav Pal, Director-NCL-Pune, Prof. Sathyamurthy, Director-IISER-Mohali, Prof. Jolly, Director-IMTECH, Prof. Rakesh Tuli, and former Director-NABI. Appreciating the initiative by the INST scientists Prof Rao said chemistry gets its value when we take it to common people. Prof. Dominic Tildesley, President-Royal Society of Chemistry, London, Prof. Chakma, VC-Western University, Canada and Prof. Smith, University of York were among the foreign visitors to the event.

School children are engrossed in understanding the water purification processes that INST scientist has discovered

Prof. Dominic Tildesley, President-Royal Society of Chemistry, London gracing the occasion

PhD students of INST demonstrating 'magic ink' experiment to Bharat Ratna Professor CNR Rao

The experiments related to everyone's daily life: Electricity Generation, Solidification of Cement, Sugar chemistry, Sunscreen, Magic Ink, Water Purification, Chemistry involved in digestion etc. were demonstrated during the road show by groups of INST students.

16.5 Special Outreach Lecture by Prof David Smith:

Prof. David Smith, who is a Professor of Chemistry at University of York, UK, delivered a talk entitled "From Traditional Medicine to Medicine Beyond the Molecule – Chemistry Fighting Diseases". He also performed two live experiments. In one of the experiment he showed breakage of hydrogen peroxide (H_2O_2) into H_2 and O_2 by enzymes present in liver of lamb. Catalase is an enzyme in the liver that breaks down harmful hydrogen peroxide into oxygen and water. When this reaction occurs, oxygen gas bubbles escape and create foam. In another experiment, he showed fluorescent behavior of Indian tonic water.

Tonic water (or Indian tonic water) is a carbonated soft drink in which quinine is dissolved. Tonic water is often used as a drink mixer for cocktails, especially those made with gin or vodka (for example, a gin and tonic). Tonic water with lemon or lime flavor added is known as bitter lemon or bitter lime, respectively.
Such soft drinks are more popular in the United Kingdom and Europe than in the United States. Tonic water will fluoresce under ultraviolet (UV) light, owing to the presence of quinine. In fact, the sensitivity of quinine to UV is such that it will appear visibly fluorescent in direct sunlight. It was a very good learning experience for the students from various schools and colleges and the students were very excited to watch these experiments live.

Prof David showing the experiments and interaction with the participants

17. STATEMENTS OF ACCOUNTS AND FINANCIAL MATTERS

Statement of Accounts 2015-16

AUDITORS' REPORT

The Director,

INSTITUTE OF NANO SCIENCE AND TECHNOLOGY Mohali, Punjab

We have examined the attached Balance Sheet of INSTITUTE OF NANO SCIENCE AND TECHNOLOGY, Mohali, Punjab, as at March 31, 2016, Income and Expenditure Account and Receipt and Payment Account for the year ended March 31, 2016. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with Auditing Standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall financial statements presentation. We believe that our audit provides a reasonable basis for our opinion.

We further report that:

a) We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit ;

b) In our opinion, proper books of account, as required by law, have been kept by the Institute so far as appears from our examination of those books ;

c) The Balance Sheet, Income and Expenditure Account and Receipt and Payment Account of the Institute are in agreement with the books of account ;

d) In our opinion and to the best of our information and according to the explanations given to us, the said accounts read together with and subject to the Significant Accounting Policies and Notes to Accounts thereon, give the information in the manner so required, and present a true and fair view, in conformity with the accounting principles generally accepted in India ;

1. In so far as it relates to Balance Sheet, of the state of affairs of the Institute as at March 31,2016;
2. In so far as it relates to the Income and Expenditure Account, of the Excess of Expenditure over Income of the Institute for the period ended on that date.

For Balwinder Associates
Chartered Accountants
(FRN: 014822N)

Place: - Mohali
Date: - 20.07.2016

(Gaurav Thapar)
(Partner)
(Membership No.: 095710)

17.1 BALANCE SHEET AS AT 31.03.2016

CORPUS/CAPITAL FUND AND LIABILITES	SCHEDULES	CURRENT YEAR	PREVIOUS YEAR
CORPUS/CAPITAL FUND	1	334604505.62	269604505.62
RESERVE AND SURPLUS	2	-85692090.16	-54042107.46
EARMARKED/ENDOWMENT FUND	3	0.00	0.00
WELFARE FUND	3A	27316.00	9725.00
PROJECT ACCOUNT	3B	99221074.00	9606366.00
SECURED LOANS AND BORROWING	4	0.00	0.00
UNSECURED LOANS AND BORROWING	5	0.00	0.00
DEFERRED CREDIT LIABILITIES	6	0.00	0.00
CURRENT LIABILITIES & PROVISIONS	7	4953922.00	3982239.00
TOTAL		**353114727.46**	**229160728.16**
ASSETS			
FIXED ASSETS	8	181907399.58	174797635.65
INVESTMENT FROM EARMARKED/ENDOWMENT FUNDS	9	0.00	0.00
INVESTMENTS-OTHERS	10	0.00	0.00
CURRENT ASSETS, LOANS AND ADVANCES	11	171207327.88	54363092.51
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)		0.00	0.00
TOTAL		**353114727.46**	**229160728.16**
SIGNIFICANT ACCOUNTING POLICIES	25		
NOTES ON ACCOUNTS	26		

As per our report of even date.

For INSTITUTE OF NANO SCIENCE AND TECHNOLOGY

For **BALWINDER ASSOCIATES**
Chartered Accountants

Firm Registration No. 014822N

ASHOK KUMAR KAKRIA
Consultant (F & A)

UMESH CHANDRA PRASAD
Chief Finance & Administrative Officer

(Gaurav Thapar)
(Partner)
M.No. 095710
Place: Mohali
Date: 20.07.2016

ASHOK KUMAR GANGULI

Director

17.2 RECEIPT & PAYMENT

FOR THE PERIOD 1-4-2015 TO 31-03-2016

RECEIPT	Current Year	Previous Year	PAYMENT	Current Year	Previous Year
Opening Balances			**Revenue Expenses**		
a) Cash in Hand	21276.00	191308.00	Establishment As per Schedule	55575165.00	34609191.00
b) With Canara Bank			Other Expenses As per Schedule	31465572.65	38106319.65
In Current Account	43839.32	4905.29	Project Expenses As per Schedule	4365723.00	3639412.00
In Deposit Account	54105551.19	201700361.57	**Capital Expenditure on Fixed Assets**		
Cheque Pending Realisation	0.00	75000.00	As per Schedule	36623803.00	169933003.00
Grants Received			**Other Payments/Advances** (At the end of the year)		
Corpus/Capital Fund (As per Schedule)	65000000.00	15700000.00	Advance to Parties	141348.00	68929.00
Interest on F.D. from Corpus Fund	0.00	8904505.62	Advance to Staff	35100.00	61500.00
Revenue Fund (As per Schedule)	85000000.00	48780000.00	INST Projects	114113.00	0.00
Projects Grant (As per Schedule)	88215682.00	9305457.00	T.D.S. Recoverable	116746.00	52272
Interest on F.D. from Projects Grants	1399026.00	300909.00	**Any Other Receipts** (At the beginning of the year)		
Welfare Fund	17591	0.00	T.D.S. Payable	7050.00	0
Interest Received			Cheques Pending Encashment	515106.00	2282626.00
Interest from Bank Deposits As per Schedule	2676085.02	0.00	Expenses Payable	3428483.00	1223947.00
Fees Subscriptions Received As per Schedule	175054.00	543994.68	Security/EMD Deposits Received	31600.00	110231.00
Other Income (specify) As per Schedule	1419378.00	442195.00	**Closing Balances**		
Other Payments/Advances (At the beginning of the year)			a) Cash in Hand	20928.00	21276.00
Advance to Parties	68929.00	9985090.00	**b) With Canara Bank**		
Advance to Staff	61500.00	35000.00	In Current Account	48661062.67	43839.32
T.D.S. Recoverable	52272.00	176741.00	In Deposit Account	122014597.21	54105551.19
Against Conferences	0.00	4130391.00	In Employees Benevolent Account	27316.00	9725.00
Adjustment of Boundary Wall (CPWD)	0.00	0.00	Cheque Pending Realisation	76117.00	0.00
Security/EMD Deposits Received	84100.00	31600.00			
Employees Benevolent Account	9725.00	9725.00			
Any Other Receipts (At the end of the year)					
T.D.S. Payable		7050.00			
Cheques Pending Encashment-INST	908573.00	352035.00			
Cheques Pending Encashment-Projects	1064865.00	163071.00			
Expenses Payable	2896384.00	3428483.00			
	303219830.53	304267822.16		303219830.53	304267822.16

As per our report of even date.

For INSTITUTE OF NANO SCIENCE AND TECHNOLOGY

For BALWINDER ASSOCIATES
Chartered Accountants
Firm Registration No. 014822N

ASHOK KUMAR KAKRIA
Consultant (F & A)

UMESH CHANDRA PRASAD
Chief Finance & Administrative Officer

(Gaurav Thapar)
(Partner)
M.No. 095710
Place: Mohali
Date: 20.07.2016

ASHOK KUMAR GANGULI
Director

17.3 INCOME AND EXPENDITURE

FOR THE PERIOD 01.04.2015 TO 31.03.2016

	INCOME	**Schedules**	**Current Year**	**Previous Year**
1	Income from Sales and Services	12	250000.00	0.00
2	Grants/subsides	13	85000000.00	48780000.00
3	Fees/subscriptions	14	175054.00	543994.68
4	Income from Earmarked fund	15	0.00	0.00
5	Income from royalty, Publications etc.	16	0.00	0.00
6	Interest	17	2676085.02	0.00
7	Other Misc Income/Receipts	18	1169378.00	442195.00
8	Increase/(Decrease) in stock of finished goods & Work-in -progress	19	0.00	0.00
	TOTAL (A)		**89270517.02**	**49766189.68**
	EXPENDITURE			
1	Establishment Expenses	20	55575165.00	34609191.00
2	Other Expenses	21	31465572.65	38106319.65
3	Expenditure on grants, subsidies etc.	22	0.00	0.00
4	Interest	23	0.00	0.00
5	Depreciation on fixed Assets	8	29514039.07	24705022.94
6	Project Accounts	24	4365723.00	3639412.00
	TOTAL (B)		**120920499.72**	**101059945.59**
	Balance being excess/(shortfall) of income over Expenditure (A-B)		-31649982.70	-51293755.91
	BALANCE BEING CARRIED TO GENERAL RESERVE		-31649982.70	-51293755.91

As per our report of even date.

For INSTITUTE OF NANO SCIENCE AND TECHNOLOGY

For BALWINDER ASSOCIATES
Chartered Accountants
Firm Registration No. 014822N

ASHOK KUMAR KAKRIA
Consultant (F & A)

U C PRASAD
Chief Finance & Administrative Officer

(Gaurav Thapar) (Partner)
M.No. 095710
Place: Mohali
Date: 20.07.2016

ASHOK KUMAR GANGULI
Director

17.4 SCHEDULE FORMING A PART OF BALANCE SHEET FOR THE YEAR 2015-16

SCHEDULE NO. -1

(Amount in Rs)

	CURRENT YEAR	PREVIOUS YEAR
CORPUS/CAPITAL FUND		
Contribution towards creation of corpus fund		
Balance at the beginning of the year	269604505.62	245000000.00
Add: Addition during the year (DST)	65000000.00	15700000.00
Add: Interest on F.D with Bank made		
from Corpus fund	0.00	8904505.62
Less : Recalled Back during the year by DST	0.00	0.00
BALANCE AT THE YEAR END	**334604505.62**	**269604505.62**

SCHEDULE NO. -2

(Amount in Rs)

	CURRENT YEAR	PREVIOUS YEAR
RESERVE AND SURPLUS		
General Reserve		
Balance at the beginning of the year	-54042107.46	-2748351.55
Add: Addition during the year - transfer from Income & Expenditure Account	0.00	0.00
Less : Deduction during the year - Transfer from Income & Expenditure Account	-31649982.70	-51293755.91
BALANCE AT THE Y EAR END	**-85692090.16**	**-54042107.46**

SCHEDULE NO. -3 A

(Amount in Rs)

	CURRENT YEAR	PREVIOUS YEAR
WELFARE FUND		
Employees Benevolent Fund	26600.00	9650.00
Interest on Employees Benevolent Fund	716.00	75.00
TOTAL	**27316.00**	**9725.00**

SCHEDULE NO. -3 B

(Amount in Rs)

	CURRENT YEAR	PREVIOUS YEAR
PROJECT ACCOUNT		
DBT Project	569656.00	717729.00
Grant from DIHAR	1341200.00	0.00
SERB Project	15629381.00	3396048.00
Hindu college Delhi (Project sponsored by DST)	1600000.00	1600000.00
DST Project	78380902.00	3591680.00
Interest on F.D. from Projects Grants	1699935.00	300909.00
TOTAL	**99221074.00**	**9606366.00**

SCHEDULE NO. -7

(Amount in Rs)

	CURRENT YEAR	PREVIOUS YEAR
CURRENT LIABILITIES AND PROVISIONS		
A. CURRENT LIABILITIES		
1. Tax Deduction at source	0.00	7050.00
2. Cheques Pending Encashment- INST	908573.00	352035.00
3. Cheques Pending Encashment- Projects	1064865.00	163071.00
4. GIS Payable	483.00	483.00
5. Medical Subscription Payable	675.00	675.00
6. Provident Fund Payable	30000.00	15000.00
7. Salary & Consultancy Payable - INST	2388278.00	2817590.00
8. Salary Payable - Projects	1000.00	133031.00
9. Security/Earnest Money Deposits	84100.00	31600.00
10. NPS Subscription	445248.00	460254.00
11. Benevolent Fund	5400.00	1450.00
12. Audit fees payable	25300.00	0.00
TOTAL (A)	4953922.00	3982239.00
B. PROVISIONS		
1. Other	0.00	0.00
TOTAL (B)	0.00	0.00
TOTAL (A+B)	**4953922.00**	**3982239.00**

SCHEDULE NO. -8

(Amount in Rs)

		GROSS BLOCK					DEPRECIATION			NET BLOCK	
ASSETS	**RATE (%)**	**COST AS AT 01.04.2015**	**ADDITION USED FOR 180 DAYS OR MORE**	**ADDITION USED FOR LESS THAN 180 DAYS**	**SALE/TRANSFER DURING THE YEAR**	**COST AS ON 31.03.2016**	**AS ON 01.04.2015**	**DURING THE YEAR (Adjustment)**	**AS ON 31.03.2016**	**WDV AS ON 31.03.2015**	**WDV AS ON 31.03.2016**
Airconditioners	15.00	25,66,963.00	76,330.00	-	-	26,43,293.00	6,26,802.30	3,02,473.61	9,29,275.91	19,40,160.70	17,14,017.10
Computer & Peripherils	60.00	75,34,070.00	6,36,748.00	3,51,526.00	-	85,22,344.00	51,99,992.28	18,87,953.23	70,87,945.51	23,34,077.72	14,34,398.49
Electric items	15.00	20,41,845.00	63,671.00	1,67,940.00	-	22,73,456.00	4,44,676.49	2,61,721.43	7,06,397.92	15,97,168.51	15,67,058.08
Office Equipments	15.00	75,55,939.00	93,385.00	4,63,742.00	49,000.00	80,64,066.00	15,93,849.67	9,35,751.80	25,29,601.47	59,62,089.33	55,34,464.53
Furniture & Fixtures	10.00	148,00,425.00	3,67,007.00	17,12,710.00	-	168,80,142.00	21,41,964.02	13,88,182.30	35,30,146.32	126,58,460.98	133,49,995.68
Library Books	15.00	26,02,327.00	1,66,114.00	65,765.00	-	28,34,206.00	5,49,431.74	3,37,783.76	8,87,215.50	20,52,895.26	19,46,990.50
Building (under construction)	0.00	84,85,357.00	17,10,993.00	15,00,000.00	-	116,96,350.00	-	-	-	84,85,357.00	116,96,350.00
Lab Equipments-INST	15.00	1585,56,600.00	162,62,218.00	127,92,951.00	-	1876,11,769.00	187,89,173.85	243,63,917.95	431,53,091.80	1397,67,426.15	1444,58,677.20
Lab Equipments-Project	15.00	-	2,41,703.00	-	-	2,41,703.00	-	36,255.00	36,255.00	-	2,05,448.00
Figures for Current Year Rs.		**2041,43,526.00**	**196,18,169.00**	**170,54,634.00**	**49,000.00**	**2407,67,329.00**	**293,45,890.35**	**295,14,039.07**	**588,59,929.42**	**1747,97,635.65**	**1819,07,399.58**

SCHEDULE NO. - 11

(Amount in Rs)

		CURRENT YEAR		PREVIOUS YEAR	
	CURRENT ASSETS, LOANS & ADVANCES				
A	**CURRENT ASSETS**				
1	Cash in Hand		20928.00		21276.00
2	Bank Balances				
	Canara Bank				
	a) Current Account No. 2452201001102-INST	48606494.67		38594.32	
	b) Auto Sweep/F.D. Accounts -INST	30037607.21		47847740.2	
	c) Current Account No.2919201000578-Projects	54568.00		5245	
	d) Auto Sweep/F.D. Accounts -Projects	91976990.00		6257811	
	e) Benevolent Account No. 2919101002412	27316.00		9725	
			170702975.88		54159115.51
3	Cheque Pending Realisation		76117.00		0.00
	TOTAL: (A)		170800020.88		54180391.51
B	**LOANS, ADVANCES/DEPOSITS AND OTHER ASSETS ETC.**				
1	Loan		0.00		0.00
2	INST Projects		114113		0.00
	Advance to Parties				
	As per detail attached		141348.00		68929.00
	Advance to Staff				
	As per detail attached		35100.00		61500.00
	TDS Recoverable	20670			
	Tax Deducted at Source-project	32437			0.00
	Tax Deducted at Source-INST	63639	116746.00		52272.00
	TOTAL (B)		407307.00		182701.00
	TOTAL (A+B)		**171207327.88**		**54363092.51**

SCHEDULE NO. - 12

(Amount in Rs)

		Current Year	Previous Year
	INCOME FROM SALES & SERVICES		
1	Consultancy Project	250000.00	0.00
	TOTAL	250000.00	0.00

SCHEDULE NO. - 13

(Amount in Rs)

		Current Year	Previous Year
	GRANTS/SUBSIDIES		
1	Grant in Aid General (Plan)	24128000.00	21500000.00
2	Grant in Aid Salaries (Plan)	58872000.00	25280000.00
3	Grant in Aid Salaries-SC (Plan)	2000000.00	2000000.00
	TOTAL	85000000.00	48780000.00

SCHEDULE NO. - 14

(Amount in Rs)

		Current Yea r	Previous Year
	FEES/SUBSCRIPTIONS		
1	Application Fee	98400.00	481318.68
2	RTI Fee	104.00	176.00
3	Tender Fee	5500.00	0.00
4	Admission Fee	71050.00	62500.00
	TOTAL	175054.00	543994.68

SCHEDULE NO. - 17

(Amount in Rs)

		Current Year	Previous Year
	INTEREST EARNED		
1	On Term Deposits		
	INST Main	2676085.02	0.00
	TOTAL	2676085.02	0.00

SCHEDULE NO. - 18

(Amount in Rs)

		Current Year	Previous Year
	OTHER MISCELLANEOUS INCOME/RECEIPTS		
1	Guest House Receipts	88300.00	94650.00
2	Refund from IISER-Shifting of 220 KV HT Lines	0.00	0.00
3	Outreach Programme Receipts	277500.00	45000.00
4	Receipt from Sponsorship RTF -DCS Fellowship	0.00	270000.00
5	Miscellaneous Receipts	803578.00	32545.00
	TOTAL	1169378.00	442195.00

SCHEDULE NO. - 20

(Amount in Rs)

		Current Year	Previous Year
	ESTABLISHMENT EXPENSES		
1	Pay and Allowances	37158822.00	25046503.00
2	Salary and Wages	7186113.00	4709175.00
3	Salary Post DOC	3479816.00	1853215.00
4	Salary/Stipend Ph.D Students	6319466.00	2826297.00
5	Children Education Allowance	126490.00	60851.00
6	LTC	618651.00	0.00
7	Pension Contribution	0.00	0.00
8	Leave Salary Contribution	84875.00	0.00
9	Medical Reimbursement Expenses	600932.00	113150.00
	TOTAL	55575165.00	34609191.00

SCHEDULE NO. - 24

(Amount in Rs)

		Current Year	Previous Year
	PROJECT ACCOUNT-EXPENDITURE		
1	Advertisement and Publicity	0.00	7050.00
2	Bank Charges	724.00	509.00
3	Canteen	400.00	0.00
4	Contingency	61402.00	32039.00
5	Lab Chemicals	1061625.00	625612.00
6	Overhead Expenses	1491486.00	0.00
7	Printing & Stationery	840.00	0.00
8	Registration Fee	2000.00	4000.00
9	Salary & Allowances	1687539.00	2935964.00
10	T.A./ D.A.	59707.00	34238.00
	TOTAL	**4365723.00**	**3639412.00**

SCHEDULE NO. - 21

(Amount in Rs)

		Current Year	Previous Year
	OTHER EXPENSES		
1	Advertisement and Publicity	375869.00	677983.00
2	Freight and Cartage	90096.00	4480.00
3	Electricity/Power Supply Charges	3051544.00	532465.00
4	Custom Duty & clearance	278721.00	0.00
5	Rent for Habitat Centre	10643502.00	11195616.00
6	Repair and Maintenance	268169.00	693320.00
7	Audit Fee	70300.00	40000.00
8	Guest House Expenses	4215.00	16908.00
9	Printing and Stationery	957777.00	929937.00
10	Conveyance	1801190.00	1516663.00
11	Postage and Stamps	112576.00	75697.00
12	Miscellaneous Expenses	498493.00	64728.00
13	Bank Charges	37446.65	65949.65
14	Legal, Professional & Consultancy Charges	95087.00	103954.00
15	Honorarium Paid	188660.00	356003.00
16	Horticulture, Gardening & Plantation	26535.00	60802.00
17	Labour and Processing Expenses	26535.00	24670.00
18	Meeting Expenses	211487.00	360967.00
19	Office Expenses	65196.00	207656.00
20	Telephone Expenses	442314.00	336111.00
21	Computer Repair and Maintenance	54319.00	283098.00
22	Conference Expenses	2340868.00	4517593.00
23	Miscellaneous Consumable Stores	228765.00	153390.00
24	Membership Fees	50000.00	0.00
25	diesel for Generator Set	69854.00	70891.00
26	Exhibition Booking Charges	706953.00	0.00
27	Internet Expenses	568400.00	428265.00
28	Newspapers and Periodicals	6752.00	5698.00
29	Patent Filling	5000.00	0.00
30	Registration Fee for Conferences	119194.00	83218.00
31	Travelling Expenses	3749747	3551723
32	Web Hosting	4250.00	21000.00
33	Accommodation Expenses	76554.00	220828.00
34	Foundation Day Award	317045.00	157782.00
35	Outreach Programme Expenses	479794.00	118970.00
36	Hospitality and Staff Welfare	102190.00	196274.00
37	Fellowship Payment to RTF-DCS	36514.00	138871.00
38	Research Expense		
	- Lab Chemicals	3303661.00	10894809.00
	TOTAL	**31465572.65**	**38106319.65**

SCHEDULE NO. - 25 SIGNIFICANT ACCOUNTING POLICIES

1. **Accounting Concepts & Basis of Preparation of Financial Statements**
   The financial statements have been prepared under the historical cost convention in accordance with the generally accepted accounting principles. The Institute generally follows the accrual system of accounting and recognizes significant items of Income & Expenditure on accrual basis unless otherwise stated.

2. **Grants**
   Grants are recognized on receipt, Grants received from Department of Science & Technology (DST) for Creation of Capital Assets (Plan) is treated as corpus of the centre. Grants received for General (Plan), Salaries (Plan) and Salaries-SC (Plan) are treated as of revenue nature and shown under Income & Expenditure Account.

3. **Fixed Assets and Depreciation**
   No depreciation on the Building has been charged during the year as these assets are not put to use upto 31.03.2016 as certified by the management of the Institute. Depreciation on assets has been charged at the rates applicable under Income Tax Act. Depreciation, on assets used for less than 180 days, is restricted to 50% of the prescribed rates. Cost of Fixed assets includes Custom Duty, Clearing & Forwarding Charges and Freight relating to such assets.

For **Balwinder Associates**
Chartered Accountants
(FRN.: 014822N)

Place: Mohali
(Gaurav Thapar)
Date: 20.07.2016
(Partner)
(Membership No.: 095710)

SCHEDULE NO. - 26 NOTES TO THE ACCOUNTS

1. Department of Science and Technology (DST) Sanctioned and Released Rs 2000 Lakhs (Rs 1000 Lakhs in the financial year 2008-2009, Rs 1000 Lakhs in the financial year 2009-2010 under Nano Mission Grants). During the year 2013-2014 the Department of Science and Technology released grant of Rs. 540 Lakhs and out of which 90 Lakhs recalled back, hence net grant of Rs. 450 Lakhs received during the year 2013-2014. During the year 2014-2015 the Department of Science and Technology released grant of Rs. 644.80 Lakhs. During the previous year 2015-2016, total Grant of Rs. 1500 is received as per following detail:

Rs. In Lakhs

-Grant in Aid Creation of Capital Assets (Plan)	150.00
-Grant in Aid General (Plan)	241.28
-Grant in Aid Salaries (Plan)	588.72
-Grant in Aid Building	500.00
-Grant in Aid Salaries-SC (Plan)	20.00
	1500

As certified by the management of the Institute, the Grant in Aid Creation of Capital Assets (Plan) of Rs. 150.00 Lakhs has been shown as Corpus/Capital Fund and all the remaining Grants amounting of Rs. 850.0 Lakhs has been shown as of revenue nature under Income & Expenditure Account. As certified by the management of the Institute the entire Grant in aid of Rs. 2000 Lakhs released under the Nano Mission Grants has been utilized for creation of Capital Assets and hence capitalized in the Balance Sheet.

As certified by the management of the Institute, total of Rs. 97521139.00 has been received as Grant in Aid for various projects upto 31.03.2016, which has been incorporated in the final accounts of the Institute. During the year Rs. 26600.00 has been contributed as Benevolent Fund by the employees of the Institute which has been incorporated in the final accounts of the Institute.

2. The financial statements have been prepared under the historical cost convention in accordance with the generally accepted accounting principles. The Institute generally follows accrual system of accounting and recognizes significant items of Income & Expenditure on accrual basis unless otherwise stated as certified by the management of the Institute.

3. In the opinion of the management the current assets, loans and advances are approximately of the value stated, if realized in the ordinary course of business. The provision of all the known liabilities is adequate and not excess of the amount considered reasonable necessary.

4. No depreciation on the Building has been charged during the year as these assets are not put to use upto 31.03.2016 as certified by the management of the Institute. Depreciation on assets has been charged at the rates applicable under Income Tax Act. Depreciation, on assets used for less than 180 days, is restricted to 50% of the prescribed rates. Cost of Fixed assets includes Custom Duty, Clearing & Forwarding Charges and Freight relating to such assets.

5. As certified by the management of the institute that the cost of all Laboratory Chemicals of Rs. 50.09 Lakhs purchased during the year 2015-2016 has been issued to laboratory and the same has been consumed upto 31.03.2016. Hence total cost of Rs. 50.09 Lakhs has been charged to Income & Expenditure Account.

6. During the year, an amount of Rs. 17.09 lakhs has been transferred from lab chemicals to lab equipments on account of prior period adjustment for amount wrongly debited to lab chemicals, instead of Lab equipments and depreciation has been charged accordingly.

7. Cash in Hand, Bank Balances and Fixed Deposit Balances as on 31.03.2016 shown in the Balance Sheet are as certified by the management of the Institute.

8. Audit fee of Rs. 45000/- relating to auditor for FY 2014-15 has been booked in current year.

9. The Interest earned and accrued during the year shown as Income in the Income & Expenditure Account is as certified by the management of the Institute. Interest earned on Fixed Deposits has been calculated and adjusted on the basis of Certificate of Fixed Deposit Balance as on 31.03.2016, along with Fixed Deposit statement, issued by the Canara Bank.

10. Previous year figures have been regrouped/rearranged where ever considered necessary.
11. All Schedules form an integral part of the Balance Sheet and Income & Expenditure Account and have been duly authenticated by the management of the Institute.

For **Balwinder Associates**
Chartered Accountants
(FRN.: 014822N)

Place: Mohali
(Gaurav Thapar)
Date: 20.07.2016
(Partner)
(Membership No.: 095710)

18. HUMAN RESOURCE

LIST OF EMPLOYEES RECRUITED ON SANCTIONED POSITION.

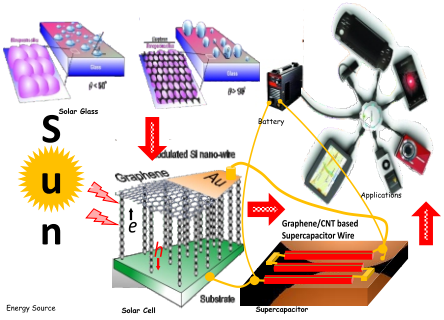
Sr.	Name	Designation
1	**Prof. A. K. Ganguli**	**DIRECTOR**
2	Dr. Abir De Sarkar	Scientist E (Associate Prof.)
3	Dr. Surajit Karmakar	Scientist E (Associate Prof.)
4	Dr. Sharmistha Sinha	Scientist D (Assistant Prof.)
5	Dr. Suvankar Chakraverty	Scientist D (Assistant Prof.)
6	Dr. Kaushik Ghosh	Scientist D (Assistant Prof.)
7	Dr. Jiban J Panda	Scientist C
8	Dr. Kiran S Hazra	Scientist C
9	Dr. Priyanka	Scientist C
10	Dr. P.S.Vijaya Kumar	Scientist C
11	Dr. Rahul K Verma	Scientist C
12	Dr. Sangita Roy	Scientist C
13	Dr. Sonalika Vaidya	Scientist C
14	Dr. Tapasi Sen	Scientist C
15	Dr. Asifkhan Shanavas	Scientist B
16	Sh. Bhanu Prakash	Scientist B
17	Dr. Chandan Bera	Scientist B
18	Dr. Deepika Sharma	Scientist B
19	Dr. Manish Singh	Scientist B
20	Dr. Monika Singh	Scientist B
21	Dr. Menaka Jha	Scientist B
22	Sh. Mukesh Raja	Scientist B
23	Dr. Neha Sardana	Scientist B
24	Dr. Rehan Khan	Scientist B
25	Dr. Subhasree R Choudhury	Scientist B
26	Dr. Shyam Lal M	Scientist B
27	Dr. Sanyasi N Boddu	Scientist B
28	Dr. Vivek Bagchi	Scientist B
29	Ms. Sweta Belwal	Stenographer
30	Sh. Rajpreet Singh	Stenographer

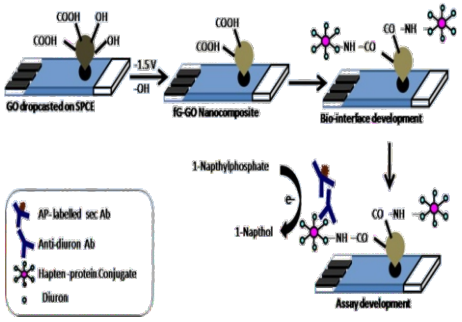
New appointments made during 2015-16		
1	Sh. U.C. Prasad	Chief Finance and Administrative Officer
2	Dr. Asish Pal	Scientist E (Associate Prof.)
3	Dr. Ehesan Ali	Scientist E (Associate Prof.)
4	Dr. Kamalakannan Kailasam	Scientist E (Associate Prof.)
5	Dr. Prakash Pandisala Neelakandan	Scientist-E (Associate Prof.)
6	Dr. Jayamurugan Govindasamy	Scientist-D (Assistant Prof.)
7	Dr. Ramendra Sundar Dey	Scientist-B

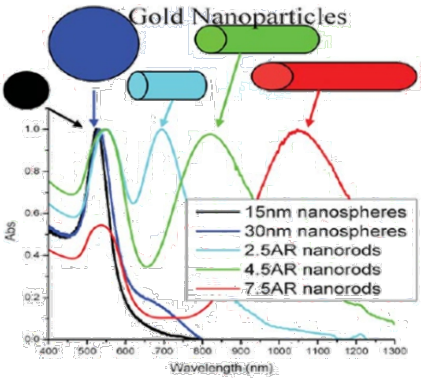
Contractual administrative positions		
1	Mr. P K Datta	Consultant and Head (Projects)
2	Mr. A K Kakria	Consultant (F&A)
3	Mr. J.N. Ahuja	Chief Security Officer
Contractual through outsourcing agency		
1	Security Supervisor cum Caretaker	01
2	Office Assistant	06
3	Security Guards and Housekeeping Staff	23

DST Young Scientist	
1	Dr. Sucheta De

Group picture of INST family







INSTITUTE OF NANO SCIENCE AND TECHNOLOGY

(An Autonomous Institute of Department of Science and Technology, Govt. of India)

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