R.S.S.P. Mandal's

Nanasaheb Yashvantrao Narayanrao Chavan Arts, Science & Commerce College Chalisgaon. Dist – Jalgaon

Department of chemistry

Industrial Visit Report

National Center for Nanoscience and Nanotechnology, University of Mumbai.

2023-24

Visit Location:- National Center for Nanoscience and Nanotechnology, University of Mumbai.

Date of Visit:- 15/03/2024

Timing of Visit:- 11.30 am onwards

Name of the Director:- Prof. Vishwanath R. Patil

Name of student:- Patil Harshada Bapu

Class:- T. Y. B. Sc. (Chemistry)

Signature:- HBPatil

Objective:

The industrial visit was organized for us to learn Nanoscience and Nanotechnology and Machine Learning applications. R&D in Nano-sciences and Nanotechnology, with thrust area of Materials Science leading to industry-ready technology and Development of human resources to implement the technology. Nanosciences and Nanotechnology being an interdisciplinary subject offers knowledge, understanding and output that is integrated and Interdisciplinary in nature.

Activities Conducted:

On 15th March 2024, 20 students of third year of chemistry along with 5 faculty members visited National Center for Nanoscience and Nanotechnology, University of Mumbai. We left from college on 14th march 2024 at 10:30 pm and reached University of Mumbai by 11:30 am on 15th March 2024. We travelled in a travel train with students and faculty to guide us. As we reached the University of Mumbai, we were greeted in friendly manner by them. Initially they talked about the history of National Center for Nanoscience and Nanotechnology, University of Mumbai and there working style.

About Visited Industry (NCNNUM):

The National Centre for Nanoscience's and Nanotechnology, University of Mumbai (NCNNUM) has undertaken R&D and Training Programmes to meet some of the challenges of nanotechnology development. University of Mumbai will focus on R&D in Nanoscience's

and Nanotechnology leading to industry-ready technology and Development of human resources to implement the technology.

The total cost of the project for the Centre for Nano-science and Nanotechnology was estimated at Rs.100.00 crores. The Centre will house sophisticated equipment worth Rs. 70 crores for Nano-synthesis and Nano-characterization. Non-recurring expenditure for building, infrastructure, etc. is estimated at Rs. 15 crores. Recurring expenditure for faculty, staff, fellows, consumables, etc shall be Rs.15 crores for 3 years. It is thought that Nanotechnology will impact significantly the industries related to Energy, Health-care, Chemical & Materials (Materials Science) and Electronics. UoM has decided to focus on Materials Science for industrial applications as its thrust area. In the next Five Years, UoM will focus on

1. R&D in Nano-sciences and Nanotechnology, with thrust area of Materials Science leading to industry-ready technology and
2. Development of human resources to implement the technology

The Programmes planned are:

1. Catalyzing University for increased R&D output
2. Innovation Park for industries,
3. Nanotechnology Education initiative
4. Green Nanotechnology

There will be strong links with industry through Innovation Park programme where faculty members would partner with industries for innovations. In the next five years the Centre has targeted to produce 100 PhDs, 120 MSc students, 60 M Tech students in the field of Nanotechnology, in next five years. We also have targeted to get about 50 projects from industry in the next five years. The Programme also includes development of Social Sciences and other departments. The estimated cost of Rs.100.00 crores for the next five years, have been budgeted for the proposed programmes

Infrastructure of NCNNUM

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LIST OF NANOFABRICATION TOOLS

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- Molecular Beam Epitaxy (MBE)
- Combined Pulsed Laser Deposition (PLD) and Pulsed Electron Deposition (PED) System
- Customized Pulsed Laser Depostion System (PLD)
- Focused Ion Beam Lithography (FIB)
- Plasma Enhanced Chemical Vapor Deposition System (PECVD)
- Electron Beam Lithography (EBL)
- Optical Lithography
- Mask Aligner

LIST OF NANOMATERIAL SYNTHESIS SETUP

- Ball Mill
- Electro-Spinning Spray Unit
- Supercritical CO2 Extractor
- Ultra Centrifuge System

LIST OF NANO-CHARACTERIZATION TOOLS

SPECTROMETRY

- Flouresence Spectrometer
- Fourier Transform InfraRed (FT-IR) Spectroscopy
- UV-Vis-NIR Spectrophotometer
- Mass Spectrometer LC-MS
- Micro-Raman Spectroscopy
- Photoluminesence Spectroscopy
- Nano-IR Spectroscopy
- Circular Dichroism spectrometer
- Inductively Coupled Plasma Mass Spectrometer (ICP-MS)
- Inductively Coupled Plasma Optical Spectrometer (ICP-OS)

MICROSCOPY

- Scanning Electron Microscopy (SEM)
- Field Emmision Scanning Electron Microscopy (FESEM)
- Ultra-High Resolution Transmission Electron Microscopy (HRTEM)
- Scanning XPS Microprobe
- Atomic Force Microscopy (AFM)
- Scanning Probe Microscopy (SPM)
- Bio-Atomic Force Microscopy (Bio-AFM)

CRYSTALLOGRAPHY

- X-Ray Diffraction (XRD)
- Particle Size & Zeta Potential Analyzer Instrument

TEM/SEM SAMPLE PREPERATION KIT

- Plasma Cleaner
- Ion Beam Milling

LIST OF PHYSICAL MEASUREMENT EQUIPMENTS

ELECTRICAL MEASUREMENTS

- Semiconductor Characterization System (Keithley 4200)
- LCR Meter
- Solar Simulator (AM 1.5G)
- Agilent Network Analyser
- Electrochemcial System (Autolab)
- AC Susceptibility

MECHANICAL ANALYSIS

- Stylus Surface Profilometer
- Nano Indentation
- Nano Rheometer
- High Temperature Tribometer

- Contact Angle Measurements
- Differential Scanning Calorimetry

OPTICAL PROPERTIES

- Dual Core 3D Profiler Imaging & Interferometer System
- Fluorescence DIC Biological Microscope
- Nano Photometer
- Inverted Metallurgical Microscope

MAGNETIC MEASUREMENTS

- Magnetic Hysteresis Loop Tracer
- Physical Property Measurement Systems (PPMS)

OTHER FACILITIES

CHEMICAL ANALYSIS TECHNIQUES

- High Performance Liquid Chromotography (HPLC)
- Liquid Chromotography Mass Spectroscopy (LCMS)
- Gas Chromatography (GC)

ADDITIONAL FACILITIES

- Servers for Computational Nanotechnology
- Liquid Nitrogen Plant
- Security System : IP Camera and Facial Recognition System
- Solar Powered Electrical System
- Laminar Fume Hoods

TEACHING KITs

- Fuel Cell teaching kit
- Electrochemistry teaching kit
- Raman teaching kit
- STM teaching kit
- Nanotechnology Education Software
- Atomistix toolkit and virtual nanolab

Outcome from visit:

- Awareness of research ongoing in the field of Nanosciences and nanotechnology,
- We observed Nanosciences and nanotechnology laboratory work
- We realized practical applications Nanosciences and nanotechnology.
- We learn Nanosciences and Nanotechnology being an interdisciplinary subject which offers knowledge, understanding and output that is integrated and Interdisciplinary in nature.

Visit Location:- National Center for Nanoscience and Nanotechnology, University of Mumbai.

Visit Location:- Nanoscience and Nanotechnology laboratory, University of Mumbai.

Mr. N. U. Chavan
Trip coordinator

Dr. S. J. Wagh
Head, Dept. of Chemistry

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