B. M. S COLLEGE OF ENGINEERING

Department of Medical Electronics Engineering

(Autonomous under VTU)

INDUSTRIAL VISIT REPORT

V Semester

(2021-2022)

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Place of visit: Jain Deemed-to-be University - Centre for Nano and Material Sciences (CNMS).
Date of visit: 22 March 2022
Faculty coordinators: Jisha P. and Niranjan K. R.

The Centre for Nano and Material Sciences (CNMS) is a research centre established by JAIN (Deemed to be University). Catalysis, electrochemistry, neurochemistry, and energy materials are the emphasis of the centre's chemistry research. CNMS envisages total nanoengineering via nano design, nanomanufacturing, nanosafety and nano business. Its mission is to advance fundamental knowledge of methods and components in order to build more efficient technologies.

The visit started with a tour of all the laboratories at the Centre. These labs are equipped with advanced technology and students had the opportunity to understand the applications and the working of these devices. The real time applications of nanomaterials were demonstrated to the students.
Some of the labs that the students visited are:

- Low dimensional material lab - Zeta potential is used to estimate the degree of surface charge of a nanomaterial. UV-VIS spectroscopy is utilised to synthesize nanomaterials. The spectrometer used is UV1900i which is a double-beam UV-Vis Spectrophotometer using Shimadzu's original LO-RAY-LIGHT™ diffraction grating technology.
- Catalysis and Synthesis lab / Applied nanomaterials lab - Synthesis of biodiesel from used cooking oil, dairy waste and seed oils. The dairy waste is heated at a high temperature to obtain pure oil. Some of the equipment used in the lab are: a tubular furnace, muffle furnace, oil bath, microcentrifuge, hot air oven, fume hood and a rota evaporator.
- Functional particles and surface lab - Focuses on nano board technology. The research focuses on nanomaterial studies in cancer application. Researchers are working on a drug delivery system, a nanothermometer and bioprobes. The spectrofluorometer, which is used to measure the fluorescence of a particle, was the highlight of this lab.
- Organometallics lab - The main instrument used in this laboratory was the glove box (KIYON) and the rotary evaporator. A demonstration on how to operate the glove box was given.
- Functional material and devices lab - This lab focused on the synthesis and application of materials. They mainly work on 2D materials like graphene and other transitional metals. Microwave radiation, hydrothermal method, tubular furnace method are the various techniques used to achieve the synthesis of materials. The application of materials revolved around supercapacitors.

- Synthetic organic chemistry lab - The main equipment and studies done in this lab revolved around Carbines, TLC chamber, GCMS.
- Applied electrochemistry lab - This lab specialized in energy storage devices. The studies on energy storage devices involved computer technologies and wearable sensors. Demonstration of data collection and analysis was given.
- Sustainable energy materials and processes lab - Focuses on sustainable materials. The highlight of this lab was the water purifying plastic membrane. Their main area of research was on waste particle purification.
- Bio-organic and clinical chemistry lab - Synthesis of nanomaterials (MOFS). A brief overview about the analysis on separation of biological entities (like cancer cells) from bloodstreams using nanotechnology was given . They are also working on a drug delivery system. The operation of the BET surface analysis equipment was demonstrated and explained.
- Photo and electrocatalysis lab - This lab specialized in 2D materials and dye degradation studies. They work with photoactive materials, sensors and solar cells. Three different types of membranes are used for water purification studies - electro nanofiber membrane, nanofiber and flat sheet membranes.

The morning session and the visit to the laboratories ended with a quick group photo session.

There were three talks by Dr Shajesh, Prof. R. Geetha Balakrishna and Dr Akshaya K Samal scheduled for the afternoon session.

- Talk on nanomaterial science by Dr Shajesh - The students were given a brief understanding of ultrabright multiplexes, preclinical fluorescence imaging, ultrabright NIR probes, nanothermometers, and how to change the chemical and mechanical characteristics of nanomaterials for diverse applications.

- Talk on photoelectrode active materials by Geetha Balakrishna - A quick rundown of the nanoparticles lab's research (photovoltaics, electrochemical sensing, and quantum bot-based optical sensing) was presented.The researchers discussed the biggest challenge they had during the study, which was dealing with PQDs (Perovskite Quantum Dots).They are now working on lead-free PQDs for pathogen detection, as well as a sandwich immunoassay detection platform for pathogen detection and multiplex detection demonstration.

- Talk on design and fabrication of anisotropic nanomaterials for environmental applications by Akshaya K. Samal - The lecture provided students with an overview of nanotechnology in nature and its applications. The speaker's research covered studies on nanoscale surface area, copper oxide and silver nanocubes, and iron oxide octahedra, among other topics.

The industrial visit helped the students in understanding the science and the technology behind the design, fabrication and application of nanomaterials. All the UG and PG students had the opportunity to interact with subject matter experts.

The industrial visit was a welcome experience for all the students and every student looks forward to the next industrial visit.