Report of Laboratory Visit
as part of
One Day Science Outreach Programme

September 14, 2018

Organised by

CSIR - National Institute for Interdisciplinary Science and Technology, Trivandrum

As a pre-event of IISF-2018, The CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Pappanamcode has organised a one day Science Outreach Programme involving students and public on September 14, 2018 to make them aware of the R&D activities of CSIR-NIIST. The programme was a part of IISF (4^{th} India International Science Festival) 2018 organized by Ministry of Science and Technology and Ministry of Earth Sciences in association with Vignana Bharati at Indira Gandhi Pratisthan. The programme featured invited and popular science lectures, open house laboratory visits, exhibition of technologies, interaction of students with scientists and research scholars, and interactive quiz programme.

From our college (Government College, Karyavattom), 3 students from B.Sc Industrial chemistry department, 2 students from biotechnology department and 5 students from Physics Post Graduation department attended the programme. Two among the staffs-Dr.Jolly Bose R (Assistant Professor of Department of Physics) and Dr.Bijitha.B (Assistant Professor of Department of Chemistry) accompanied us.

We started at 7:30 am on September 14, 2018 from college and reached CSIR-NIIST, Pappanancode at 9 am. The programme started at 9:30 am with an inaugural section that included a welcome speech, felicitation by Dr. Ayyappanpillai Ajayaghosh, the Director of CSIR-NIIST. The programme started at 9.30 AM. The welcome and presidential address was delivered by Dr. A. Ajayaghosh, Director, CSIR-NIIST. He IISF-2018 to be organized at Indira Gandhi Pratishthan in Lucknow during 5-8 October, 2018. He emphasised the need for taking up science education and research at par with international standards for sustainable growth of the nation. He observed that the progress of the nation depends on the advancement in science and technology while the scientific knowledge has to be innovatively utilized for the development of smart products and technology.

Prof. Achuthsankar S. Nair, a well-known academician and Head of Dept. of Computational Biology and Bioinformatics, University of Kerala was the chief guest of the function. He delivered a highly motivational lecture on 'innovations in science and technology' for about 45 minutes. He pointed out that the 'heart valve replacement' of Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum could be rated as one of the most valuable innovations happened in Kerala. Dr. Vijayamohan K. Pillai, Director, CSIR-CECRI was actively involved in the function throughout as Guest of Honour. He gave a highly interactive lecture for about one hour. His lecture mainly focussed on the 'Grand Challenges' of mankind in the future.

Dr. A. Ajayaghosh, Director, CSIR-NIIST delivering the Presidential address

Popular Science Lecture by Guest of Honour Dr. Vijayamohan K. Pillai.Director, CSIR-CECRI, Karaikudi

The lab tour started at 11:45 am after a tea break and the students visited the laboratories in several groups. Our first visit was to the Agrochemical lab where different methods to preserve food products such as drying it without losing the nutritional value were done. Working of instruments such as RADD-Refrigeration Adsorption Dehumidification Drying was explained. The process involves drying the materials under controlled temperature and uniform distribution of air to retain the properties and nutrients. The Agro processing and Natural products division using RADD method was found to have a shelf life ranging from 3 months to 1 year. Packets of spinach, carrot, ginger, dried spices, essential oil etc were exhibited.

Then we went to the Biotech lab where techniques to make new polymers that could replace plastics were done. Biodegradable polymers such as poly- gamma glutamic acid and PHB-Polyhydroxybutyrate were studied in this department. Process of Hyper Polymer Liquid chromatography (HPLC) was also explained.

Lab Visit

The Biofuel-Pilot plant was where Bioethanol from lignocellulosic feedstocks was produced. The second generation ethanol from agricultural residues provides additional sources of remuneration to farmers, address the growing environmental concerns and support the Ethanol Blended Petrol programme. The process includes pretreatment of biomass which yielded glucose that on fermentation gave ethanol. This ethanol was purified using distillation methods.

Then we visited the C V Raman Block. The Raman spectroscopy techniques using He-Ne lasers and Confocal Raman spectrometer that could reveal the vibrational states of a molecule was very well explained there. UV visible absorption spectrometer which was used to study how molecules absorb light was presented in Photochemistry instrumentation lab. Next was NMR spectroscopy that involves high resolution mass spectrometry which use orbit trap analyzer.

Our team then moved to the Chemical Science and technology division after a lunch break. In this lab third generation dye-sensitized solar cells were produced. These solar cells used a mesoporous TiO2 coating which improved its efficiency. These solar cells could work in diffused lights and indoor light. It could also work in vertical position (green building concept). Also, the dyes used could be of different colours that could make them visually appealing.

Scientists of Thermal Analysis and Metallurgy branch explained the change in properties of materials with temperature, using a thermocouple setup. Parameters like Thermogram, DTG, DTA (differential thermal analysis) etc were also defined. There we could see an optical microscope 1500 magnification that works in reflectance mode and transmittance mode. The surface properties of materials which were transparent could be studied under transmittance mode and other materials under reflectance mode.

Next were experiments on sol-gel. Here the dyes for coating the third generation solar cells were produced. Then we went to the foundry that produces metal castings. Metals such as Aluminium and Magnesium were processed and the properties were studied here.

The lab tour ended at 4 pm after visiting the Environmental Technology division where the Persistent Organic Pollutants were studied. They explained that the half life of these pollutants were more

than 12 years and the maximum allowed limit of pollutants is 0.1 ng per cubic metre of air. Their results show that the pollution level of Trivandrum is already in the range of milligrams which is too much beyond the limits. The harmful effect of these pollutants and remedies to reduce pollution were also described.

After the tea break, there was an interactive session during which students interacted with scientists. An interactive quiz programme was also conducted and our students participated in the Quiz programme and scored 6 prizes. The programme winded up at 5 pm. The participation in this programme was indeed a chance for the students to explore the life at a research laboratory. The exhibition of technologies, products, research advancements and exciting scientific experiments from CSIR-NIIST was an added attraction for the student community.