

Report on
**Department of Science and Technology (DST), India sponsored
Synergistic Training Program Utilizing the Scientific and
Technological Infrastructure (STUTI) program**
on
Advanced Research Instruments

Organized by

**Centre of Material Sciences, University of Allahabad
during 23rd August 2022 to 29th August 2022**

The STUTI program started with inaugural function. Prof. Ravindra Dhar, Coordinator of the program and Coordinator, Centre of material Science, University of Allahabad presented welcome address and provided brief introduction about the training program. Prof. Shekhar Srivastava, Director, IIDS, University of Allahabad, Dr. Jai Prakash, Co-PI of DST STUTI Program, Aligarh Muslim University, Prof. S. I. Rizvi, Dean, Research & Development, University of Allahabad, various Heads of the Departments, Coordinators of the Centres, faculty members, participants and students were present on this occasion. Prof. K. A. Suresh, an eminent Scientist from Raman Research Institute (Bangalore) and Former Director of Centre for Nano and Soft Matter Sciences (CeNS, Bangalore), was the chief guest of the programme. Prof. Sangita Srivastava, Vice Chancellor, University of Allahabad, congratulated the organizing committee and gave the concluding remark. She also spoke about the scientific journey of Prof. Meghnad Saha during her presidential address. Dr. Rjiv Giri, Assistant Professor, Centre of material Science, University of Allahabad proposed vote of thanks for the inaugural program.

After high tea, the first talk was delivered by Prof. K A. Suresh who gave detailed information about Sophisticated Analytical Instrumentation Facility (SAIF) and Sophisticated Analytical & Technical Help Institute (SATHI). Prof. Suresh informed that SAIF mostly house high end equipment like SEM, TEM, EPMA, HRMS, NMR, EPR, etc. He also discussed the main objectives of SAIF and SATHI. He also informed that the Department of Science and Technology (DST) has initiated setting up a shared, professionally managed, Science and Technology

infrastructure facility, which can be readily be accessible to academia, start-ups, manufacturing units, industries and R&D Labs.



Prof. Sangita Srivastava, Vice Chancellor, University of Allahabad, while presenting presidential address during the inaugural function



Prof. Sangita Srivastava, Vice Chancellor, University of Allahabad, while presenting memento to the chief guest Prof. K. A. Suresh, an eminent Scientist from Raman Research Institute (Bangalore) and Former Director of Centre for Nano and Soft Matter Sciences (CeNS, Bangalore) during the inaugural function

After the lunch break, Dr. Jai Prakash, Department of Physics, Aligarh Muslim University, Aligarh gave his talk on Liquid Crystal Materials and their Applications. Dr. Prakash started his talk with states of matter and explained about four states of matter Solid, Liquid, Gas, Plasma and specially the orientation of molecules in crystalline solid and Liquid. He also discussed about different phases like nematic, smectic, cholesteric and discotic etc. and informed contribution of Indian Scientist in the field of soft matter. He discussed various applications of liquid crystal materials like Pocket PC phone, Laptop Monitors, High Definition LCD TV Flexible Wrist watch,

Tunable Fabry–Perot etalon, Tunable focus liquid crystals lens, optical devices, Liquid crystal photonic bandgap etc. He also discussed about his work like Memory devices based on gold nanoparticles doped ferroelectric liquid crystals, Realization and application of liquid crystal phase shifting interferometer etc. After his lecture, the laboratory visit of participant to Centre of material Science, University of Allahabad was conducted.

The second day started with a talk by Dr. Akhilesh Kumar Singh, Associate Professor, IIT BHU, Varanasi on Characterization of Materials using Powder X-Ray Diffraction. He informed about energy and packing and discussed about origin of X-Rays and different series and informed X-Ray is non-destructive technique for analyzing the structure of materials, primarily at the atomic or molecular level. The second talk was delivered by Prof. K.A. Suresh, RRI Bangalore on X-Ray Diffraction and Nuclear Methods. He discussed about basic concepts of Electron and Neutron Diffraction. It is elastic scattering in which neutrons exiting the material have more or less the same energy as the incident neutrons. He also gave information about X-ray absorption spectroscopy (XAS) for determination of electronic structure. XAS data is obtained by tuning the photon energy in which electrons can be excited to 0.1-100 KeV. After his informative talk, demonstration of X-ray diffraction was conducted to the participants of the training programme.

The third day started with a talk by Prof. K.A. Suresh, RRI Bangalore on Electron Microscopy and Probe Microscopy. He discussed about electron microscope and informed that as electrons rather than light waves are used; it can be used to analyze structures which cannot otherwise be seen. The resolution of electron microscopy images is in the range of up to 0.2 nm, which is 1000 times more detailed than light microscopy. He also discussed about Scanning Electron Microscope (SEM) and Transmission electron microscopes (TEM). The second talk of the day was delivered by Dr. Naresh Kumar, Head, Department of Physics, MNNIT, Allahabad on Pulsed LASER Deposition (PLD): Synthesis of thin Films and nanomaterials. The laboratory session was conducted after the lunch break for the demonstration of Fourier Transform Infrared Spectroscopy.

On the fourth day, the talks were given by Prof. V.K. Tiwari, Head Department of Physics, University of Allahabad on Nuclear and Particle Physics: Basics of Instrumentation and Prof. Ravindra Dhar, Coordinator Centre of Material Sciences, University of Allahabad on Impedance Dielectric Spectroscopy. Prof. Tiwari started his talk with discussion with discovery of nucleus

by Rutherford in 1911 by alpha particle scattering experiment and informed that many particles are present inside the nucleus and hence it is called many particle system. It is very dense and made up of quarks. On the other hand, Prof. Dhar gave detailed explanation about capacitor and explained effect of dielectric on capacitance of capacitor and introduces dielectric constant or relative permittivity. He also explained effect of DC and AC on the capacitor and discussed geometry of capacitor with equivalent circuits. The demonstration of impedance analyzer for determination of permittivity of liquid crystal samples was conducted after the lunch break.

The fifth day was started with talk by Dr. Rajiv Giri, Centre of Material Sciences, University of Allahabad on Experimental Approach to Electron Microscopy and Dr. Prashant Dubey, Centre of Material Sciences, University of Allahabad gave talk on Synthesis and Characterization of Nanomaterials and their wide applications. After the lunch break the demonstration of impedance analyzer for determination of permittivity of solid samples was conducted.

On the sixth day the talk was delivered by Prof. S. K. Pandey, Dept. of Chemistry BHU, Varanasi on IR Spectroscopy and Prof. Bechan Sharma, Department of Biochemistry, University of Allahabad on Molecular Architecture for SARS COV2: Therapeutics against COVID 19 and Challenges. After the lunch break Prof. Ravindra Dhar, Coordinator, Centre of Material Sciences, University of Allahabad delivered his talk on Thermodynamic measurements and analysis of materials and after that demonstration of differential scanning calorimetry was conducted.

The seventh day started with talk by Dr. Manoj K. Singh, Centre of Material Sciences, University of Allahabad on Synthesis of multifunctional materials using Sol-Gel Method and Applications. Prof. Ranjan K. Singh, Department of Physics, BHU, Varanasi delivered talk on Raman Spectroscopy and its Applications. After lunch break Dr. Tarkeshwar Trivedi, University of Allahabad delivered talk on Ion Beam.

At the end of the program, the valedictory function took place in which the participants' were given certificates for their participation. Overall, this program was as useful to know about Advanced Research Instruments.