

Advanced Materials Characterization Techniques

27th August to 1st September 2019

About the Workshop:

Research in materials science is vital both from fundamental understanding as well as for technological applications. Properties of these materials and the performance of the devices realized from the materials are in general can be directly related to their fundamental details, for example atomic arrangement, crystal structure and surface roughness etc. Materials characterization techniques thus become an inevitable part of research in Materials Science and Engineering for the understanding of the internal details of a material at different length scales. So it is imperative to understand the fundamentals and advances of the material characterization techniques. Though there are several material characterizations are developed, this workshop was focused on the teaching of the typical characterization techniques such as electron microscopy (scanning electron microscopy, transmission electron microscopy), X ray diffraction, Scanning probe microscopy and Raman spectroscopy. In this workshop, both basics and advanced usage of each technique were covered in detail. The content of the workshop was designed in keeping the broad interests of researchers working both in the area structural materials and functional materials. The targeted audience were faculty and research students from Materials Science and Metallurgical Engineering, Physics, Chemistry, Polymer Engineering, Mechanical Engineering and other related domains. Each day, two sessions in the morning were dedicated to teach the theory related to fundamentals and advanced usage of these characterization techniques. During the afternoon sessions, the participants were facilitated to visit the characterization labs to demonstrate the basic handling of these characterization tools for practical understanding and hands of experience.

Topics covered:

The six-day workshop was focussed on the overview of the following of Materials Characterization techniques

- Basics of Electron Microscopy such as imaging, diffraction, phase contrast and advanced Electron microscopy such as STEM, EDS, EELS and In-situ TEM.
- Basics of X-ray Diffraction and its advanced usages.
- Basics of Scanning Probe Microscopy and other modes such Magnetic Force Microscopy, Piezo Force Microscopy and Electrostatic Force Microscopy
- Basics of Raman Spectroscopy and its advanced usages.
- Basics of Magnetic Characterization such as Vibration sample Magnetometry, Magneto-optical Kerr Microscopy, Magnetoresistance and Ferromagnetic Resonance methods

Intended participants:

Faculty members and Students from academic institutes; Personnel from R&D organizations; Personnel from related industries. We hope that the workshop benefited faculty and researchers from Materials Science and Metallurgical Engineering, Physics, Chemistry, Polymer Engineering, Mechanical Engineering and other related domains

Registration:

For TEQIP participants, registration is free, and accommodation and food are provided as per TEQIP norm. For Non-TEQIP participants, registration fee is there; only lunch and tea are complimentary.



Dr. Kolan Madhav Reddy is an Associate Professor in School of Materials Science and Engineering, Shanghai Jiao Tong University, Shanghai, China. His research interests are Identifying the atomic structures using state of art aberration corrected transmission electron microscopy that governs the macroscopic mechanical response of advanced materials, Advanced Ceramics, High Entropy Alloys, 2 D Materials and Catalytic Materials



Dr. Suhash Ranjan Dey is an Associate Professor in Department of Materials Science and Metallurgical Engineering, IIT Hyderabad. His research interests are Combinatorial Alloys Design of emerging materials (CIGS CZTSSe solar photovoltaics, Binary Ternary Ti based Biomaterials, IFHS Steel, Multiple Component Metallic Alloys) through combined computational and experimental techniques (Electron beam evaporation, Chemical synthesis route, Electrodeposition, Powder metallurgy) Materials Characterization using electron microscopy (EBSD, EPMA TEM) and X ray diffraction Phase transformation in metals and alloys Texture studies in metals and alloys



Dr. Sairam Krishna Malladi is an Assistant Professor in Department of Materials Science and Metallurgical Engineering, IIT Hyderabad. His research interests are In situ Transmission Electron Microscopy, In situ characterization and technique development using MEMS devices (lab on chip), Phase transformations in materials, Electrochemistry and Corrosion, Graphene based super capacitors, Materials for Energy Applications



Dr. Joydip Joardar is currently working as a Scientist-F at International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad. His research interests are Nanomaterials (intermetallics ceramic composites, chalcogenides, WS₂ solid lubricants, cermets Powder Metallurgy (mechano chemical synthesis, sintering) X ray diffraction (conventional and micro area XRD, Rietveld refinement)



Dr. Shourya Dutta Guptas is an Assistant Professor in Department of Materials Science and Metallurgical Engineering, IIT Hyderabad. His research interests are Nanophotonics, Plasmonic nanostructures and nanoparticles, Alternative materials for plasmonics, Alternative fabrication techniques Nano optical biosensors, Graphene based devices, Lab on a chip based optical devices, Microfluidic devices



Dr. Chandrasekhar Murapaka is an Assistant Professor in Department of Materials Science and Metallurgical Engineering, IIT Hyderabad. His research interests are Spintronic based memory and logic devices, Nanomagnetic materials, Domain wall dynamics in ferromagnetic networks, Spin torque nano oscillators for RF applications, Spin orbit torque induced magnetization switching and dynamics, Magnetic tunnel junctions, Micro and Nanofabrication techniques

Dr. Sairam Krishna Malladi and Dr. Chandrasekhar Murapaka

Workshop Faculty Coordinators, IIT Hyderabad