

Indian Institute Of IITK Technology Kanpur

Advanced Centre for Material Science



The Advanced Centre for Materials Science (ACMS) at IIT Kanpur houses a number of sophisticated facilities for materials synthesis, processing and characterization. These facilities are utilized by users from virtually all the departments of the Institute as well as outside industrial and academic establishments. ACMS is extensively used by postgraduate students of various departments for their theses research and is also used for training undergraduate and postgraduate students in advanced processing and characterization techniques. In addition, the resources of ACMS are used to cater to the needs of sponsored and consultancy projects and the centre also provides testing facilities for outside industries, R&D organizations and academic institutions. ACMS strives to be a centre of excellence in enabling state of the art research by providing facilities for the synthesis, processing and characterization of a wide spectrum of advanced materials: structural materials, electronic and magnetic materials, biomaterials and nanomaterials.



Areas of Research

The research activities in the Centre focus around the following thrust areas:

- ✦ Crystal Growth & Electro-Optics
- ✦ Semiconductor Physics, Thin Films
- ✦ Intermetallics and other high temperature materials
- ✦ Development of bainitic medium carbon microalloyed steels for structural applications
- ✦ Materials Chemistry
- ✦ Materials Instrumentation
- ✦ Virtual Instrumentation
- ✦ Stereology and Image Processing

All the materials synthesis, processing and characterization facilities, housed under one roof, are grouped in five user laboratories:

- ✦ Electron Microscopy Laboratory (Coordinator: Sandeep Sangal)
- ✦ X-ray Laboratory (Coordinator: Satyendra Kumar)
- ✦ Mechanical Testing Laboratory (Coordinator: Sanjeev Bhargava)
- ✦ Magnetism Laboratory (Coordinator: S. Sundar Manhoran)
- ✦ Materials Processing Laboratory (Coordinator: B.K. Mishra)

These laboratories are supported by the electronics and mechanical workshops catering to the routine fabrication and maintenance requirements of the centre. The centre also houses the IIT Kanpur National Instruments Virtual Instrumentation Cell, which acts as the central repository for hardware and software activities. The cell has two laboratories: basic and advanced. This facility is used for courses in Virtual Instrumentation and also supports projects from across the institute.

Some of the major facilities housed in the above laboratories include the following:

- ✦ Transmission Electron Microscope with EDS
- ✦ Scanning Electron Microscope with EDS
- ✦ Scanning Electron Microscope with EDS and EBSD
- ✦ Electron Probe Microanalyzer
- ✦ GATON Ion Mill
- ✦ Dimple Grinder
- ✦ MTS Universal Testing Machine
- ✦ Instron Universal Testing Machine
- ✦ SATEC Creep Tester
- ✦ Microhardness Tester
- ✦ Electric Discharge Machine
- ✦ Seifert/Isodebyeflex Diffractometer
- ✦ INEL CPS 120 Diffractometer
- ✦ Vibratory Sample Magnetometer (VSM)
- ✦ Differential Scanning Calorimetry (DSC), Thermo-gravimetric analyzer (TGA-DTA) and Dynamic Mechanical Analyzer (DMA)
- ✦ Fritsch Hot Press
- ✦ 10 Ton Hot Press
- ✦ Cold Isostatic Press
- ✦ Astro Furnace (2300-3100K)
- ✦ RF Induction Melting
- ✦ Coulter SA 3100 BET Apparatus
- ✦ Fritsche Laser Particle Size Analyzer
- ✦ Nabertherm High Temperature Furnace (2000K)

Research Projects

The Centre undertakes sponsored research in various areas with the financial support provided by external agencies. Some typical examples are:

- ✦ Hot Wheel & Hot-box detectors under the Technology Mission on
- ✦ Development of Computer Controlled Thermal Analysis
- ✦ Development of BSO Crystals for Optical Modulators
- ✦ Study of BSO group for Optical Information Processing



Industrial Projects/Consultancy

Some of the major consultancy & testing work undertaken at the Centre includes:

- ✦ Development of Catalysis (ICI India Ltd., Kanpur)
- ✦ Identification of Minerals (GSI, Lucknow)
- ✦ Testing of Strontium Ferrite Magnets (Lohia Machines, Kanpur)
- ✦ Analysis of Kidney Stones (Local Surgeons)
- ✦ Study of Activated Alumina for Defluoxidation (NNICEF)

Products, Processes and Software:

- ✦ Bismuth Silicon Oxide Single Crystals
- ✦ Computer Controlled Thermal Analyzers
- ✦ Computer Controlled Crystal Growth System



Books

- ✦ Sanjay Gupta and Joseph John, Virtual Instrumentation Using LabVIEW. Tata McGraw Hill, New Delhi, 200
- ✦ Sanjay Gupta, J P Gupta, (Ed.), PC Interfacing for Data Acquisition and Process Control, (Second Edition), Instrument Society of America, Research Triangle Park, NC, USA, 1994

Faculty

- ✦ **Sanjay Gupta:** Instrumentation
- ✦ **K.V. Rao:** Electroptic Materials & Devices
- ✦ **Satyendra Kumar:** Semiconductor Physics, Thin Films
- ✦ **Sanjeev Bhargava:** Intermetallics and other high temperature materials
- ✦ **S. Sundar Manoharan:** Materials Chemistry
- ✦ **B. K. Mishra:** Particulate Materials
- ✦ **Sandeep Sangal:** Stereology, Image Processing, Mechanical Properties

Contact

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