SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

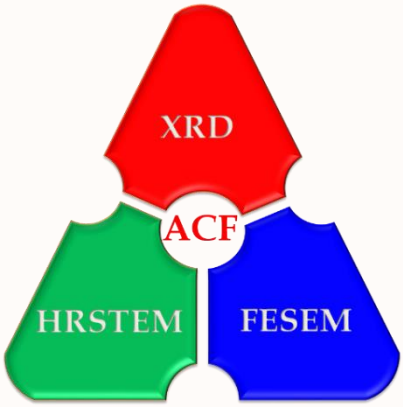
(DEEMED TO BE UNIVERSITY)

(Estd. U/S(3) of UGC Act, 1956) Accredited with Grade 'A' by NAAC
Declared as Category 'A' University by Ministry of HRD, Govt. of India

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001:2015

ADVANCED CHARACTERIZATION FACILITY

Advanced Characterization Facility (ACF) comprises three major state-of-the-art facilities namely, **X-ray Diffractometer (XRD)**, **Field Emission Scanning Electron Microscope (FESEM)** and **High Resolution Scanning Transmission Electron Microscope (HRSTEM)** to understand structure, composition, shape, size and morphology of phases of different kinds of materials down to nanometer level. This research facility at **SATHYABAMA CENTRE FOR ADVANCED STUDIES** is available to faculties, scientists and students for carrying out research, consultancy activities and to promote and strengthen collaborative activities with other institutes and industries.



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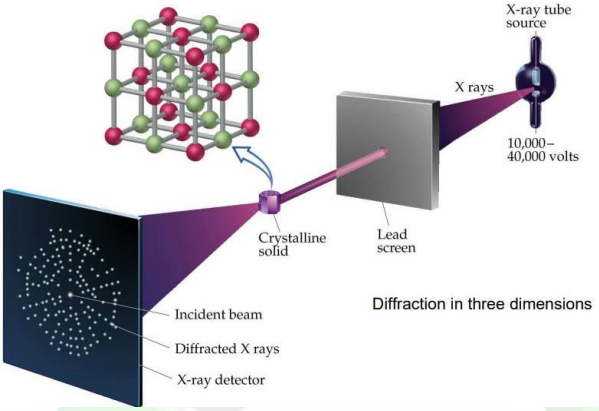
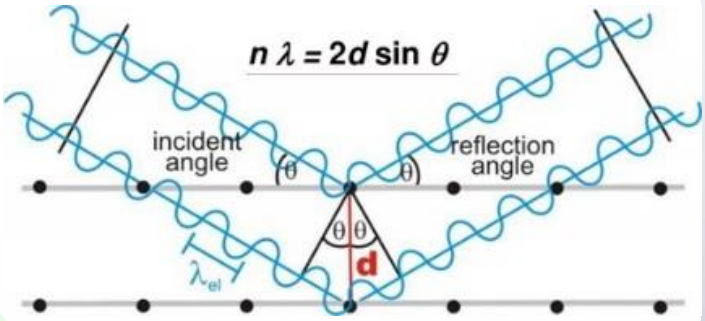
ARL EQUINOX 3000 X-ray Diffractometer

X-ray diffraction is a nondestructive technique which uses Bragg's law for analyzing a wide range of materials including metals, minerals, polymers, catalysts, pharmaceuticals, thin-films, coatings, ceramics, and semiconductors. The technique finds innumerable applications in various industries, including microelectronics, power generation, aerospace etc. X-ray powder diffraction is most widely used for the identification of unknown crystalline materials (e.g., minerals, inorganic compounds) with detection limit » 2% of sample.



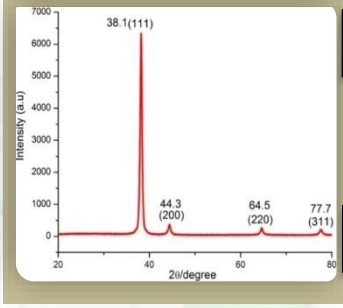


Technical Specifications

Scanning range	:	0 – 120° (2θ) simultaneous 2θ acquisition in asymmetric geometry
Goniometer	:	Fixed goniometer system
Detector	:	Curved Position Sensitive X-ray Detector, CPS120
X-ray tube	:	Cu $K_{\alpha 1}$ radiation
Sample holders	:	Fixed (No realignment needed)

Features

- Simultaneous acquisition of data over a wide angular 2θ range up to 120°
- Structural analysis of bulk powder, thin films, foils and thin plates
- High temperature XRD up to 1000°C in ambient atmosphere to study phase transition and thermal expansion of materials



APPLICATIONS

- Crystal structure
- Rietveld analysis
- Phase transition
- Thermal Expansion
- Cell parameters
- Lattice strain
- Crystallite size
- Phase identification

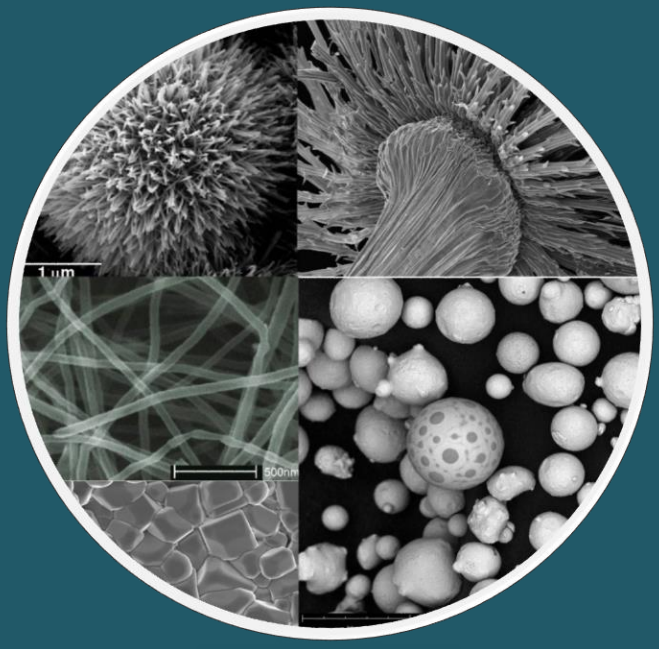
ZEISS SIGMA 300

Field Emission Scanning Electron Microscope

Field emission scanning electron microscope (FESEM) is one of the common methods for imaging the microstructure and morphology of the materials. The field emission gun (FEG) provides a pointed sharp tip as the electron source for higher resolution and magnified images. An energy dispersive X-ray spectrometer (EDS) is used for elemental analysis to confirm the presence of elements in a given material. The technique is used to gain insights into morphology with compositional details of engineered and novel materials both in bulk and thin film forms.

Technical Specifications

Nominal resolution	:	1.5 nm at 10 kV
Acceleration voltage	:	0.1 - 30 kV
Probe current	:	4 pA-10 nA
Magnification	:	12 - 900,000 X
Working Distance	:	<10mm



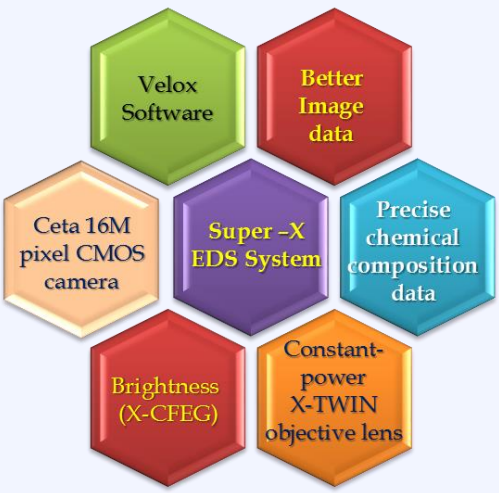
Applications

- Understanding of surface morphology
- Characterization of size, size distribution, shape and dispersion of precipitates, additives, particulates and fibers in composites and blends
- Measurement of height and lateral dimensions of nanomaterials
- Measurement of cross-sectional thickness of films and coatings
- Qualitative composition analysis

TALOS F200S G2 High Resolution Scanning Transmission Electron Microscope

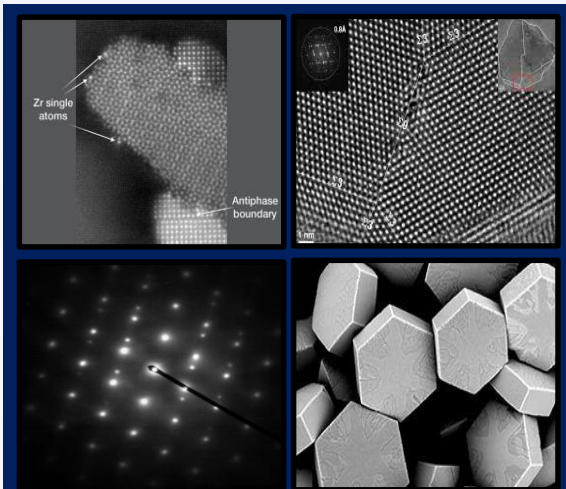
The Thermo Scientific Talos F200S G2 is a scanning transmission electron microscope that combines outstanding high-resolution STEM and TEM imaging with energy dispersive X-ray spectroscopy (EDS). It is provided with a high-resolution field emission gun, VeloX Software for fast and easy acquisition and analysis of multimodal data, rapid, precise EDS analysis of nanoscale details in 2D and 3D with high cleanliness, high throughput STEM imaging with simultaneous, multiple signal detection with better contrast for high quality images.

Features



Technical Specifications

Line resolution	:	0.10 nm
S/TEM HAADF Resolution	:	0.16 nm
Total beam Current FEG	:	>150 nA
Probe current	:	0.6 nA @1nm probe
TEM information limit	:	0.12 nm
Maximum diffraction angle	:	24°
Maximum Tilt angle with double tilt holder	:	α±35˚, β±30˚
Maximum goniometer (stage) tilt angle	:	±90˚
EDS system	:	2 SDD windowless design, shutter-protected
EDS energy Resolution	:	≤136 eV for Mn-Kα and 10 kcps (output)
Fast EDS Mapping	:	Pixel dwell time down to 10 µs
EDX solid angle	:	0.45 srad



Applications

- ❑ Distribution of dispersed phases
- ❑ Core-shell nanostructures
- ❑ Interface analysis in bulk and thin films
- ❑ Size and shape of particles
- ❑ Compositional analysis
- ❑ Crystallographic information
- ❑ Defect analysis