INFORMATION BOOKLET

SOPHISTICATED ANALYTICAL INSTRUMENTATION FACILITY (SAIF)

'A' Grade
NAAC Re-accredited
(3rd Cycle)

Kavayitri Bahinabai Chaudhari
North Maharashtra University
Jalgaon

Sophisticated Analytical Instrumentation Facility (SAIF)
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About Sophisticated Analytical Instrumentation Facility (SAIF)

Excellence and advancements in scientific research need state-of the art sophisticated equipments. With an objective to enrich analytical resources on shared basis, the sophisticated analytical instrumentation facility (SAIF) of the University is established in the University Institute of Chemical Technology. This centralized facility provides sample analysis using sophisticated analytical equipments for scientific communities in the North Maharashtra region for their advanced research with nominal charges. In very short span, the facility has grown into a major centre for spectral measurements, molecular and crystal structure determination, and materials characterization with notable revenue generation for the University.

Objectives:

- Carry out analysis of samples received from academic and research institutions, industries, and other organizations with nominal charges.
- Provide instrumental facilities for faculties, students, and industry in the region to carry out basic and applied research.
- Train research students for hands on training, operation, and maintenance of sophisticated instruments.

Availing SAIF:

The sample analysis facility is available for internal (University Campus & colleges affiliated to the University) and external users (other academic institutions and Industries). The charges are kept nominal to promote the ecosystem and scientific research culture in the University. List of the instruments along with their charges are displayed on the University website. Users can book the slot by filling up the booking form and paying the required charges for respective facility. A logbook has been maintained for each instrument to schedule the slot for the user on first come first serve basis. The user can perform the sample analysis and get the results according to the allotted slots. Hand-on training programs/workshops for post graduate students, research

students and faculties are regularly organized to train the users for carrying out sample analysis and interpretation of data.

List of Instruments and their Measuring Capabilities:

Sr. No.	Name of the Instrument	Model (Make)	Measuring Capabilities
1.	Field Emission Scanning Electron Microscope (FESEM)	Model: S-4800 TYPE II (Hitachi High Technologies Corporation, Japan.)	Surface topography of specimens, observation of thinned specimens and inner structures of fine particles such as carbon nanotubes, advanced coating thickness and structure uniformity determination. Small contamination feature geometry and elemental composition measurement. Cross section analysis, surface contamination analysis.
2.	Energy Dispersive X-Ray Spectroscopy (EDXS).	Model: X-Flash 5030 Detector Bruker AXS GmbH Germany	Foreign material analysis, Corrosion evaluation, Coating composition analysis, Rapid material alloy identification, Small component material analysis, Elemental mapping, Line scanning.
3.	X-Ray Diffractometer (XRD)	D8 ADVANCE. (Bruker India Scientific Pvt. Ltd., Mumbai.)	Rapid analytical technique used for phase identification of a crystalline material and can provide information on unit cell dimensions. Used for identification of unknown crystalline materials (e.g., minerals, inorganic compounds), determination of unknown solids, measurement of sample purity.
4.	Differential Scanning Calorimeter (DSC)	DSC-7020 (Hitachi High Technologies Corporation, Japan.)	To observe fusion and crystallization events as well as determination of glass transition temperature, crystallization temperature, melting temperature, to investigate the response of polymers to heating;
5	Thermogravimetric Analyzer (TGA)	TGA 55 (TA Instruments, Denmark.)	Used for materials characterization through analysis of characteristic decomposition patterns. It is an especially useful technique for the study of polymeric materials, including thermoplastics, thermosets, elastomers, composites, plastic films, fibers, coatings, paints. to determine changes in weight in relation to change in temperature. Measures both heat flow and weight changes (TGA) in a material as a function of temperature or time in a controlled atmosphere. The complementary

			information obtained allows differentiation between endothermic and exothermic events which have no associated weight loss (e.g., melting and crystallization) and those which involve a weight loss (e.g., degradation).
6	Particle Size Analyzer (PSA).	ZS 90(Malvern Panalytical Ltd., UK.)	Used to measure the particle size of dispersed systems from sub-nanometer to several micrometres in diameter. This technique is commonly used to measure nanoparticles size, but also to evaluate their stability over time in suspension, at different pH and temperature conditions. Zeta-potential is used to characterize nanoparticles surface charge, obtaining information about their stability and surface interaction with other molecules.
7	Contact Angle Standard Goniometer	AC21(Rame-Hart Instruments Company, NJ, USA)	To measure contact angle, surface energy and surface tension. In a contact angle measurement, the angle between the droplet and solid surface indicates the wettability of the surface. To quantify the wetting properties of surfaces is by measuring contact angles.
8	Colour Matching Spectrophotometer	SS 5100A (Premier Colourscan Instruments Pvt. Ltd., Mumbai.)	Used to numerically quantify colours by illuminating the sample with light through three primary colour filters.
9	Fourier Transform Infrared Spectrophotometer (FTIR)	ALPHA II Platinum ATR (Bruker India Scientific Pvt. Ltd., Mumbai.)	Used to obtain infrared spectrum of absorption, emission, and photoconductivity of solid, liquid, and gas. It is used to detect different functional groups in PHB.
10	UV Visible Spectrophotometer (UV).	Cary 60 (Agilent Technologies India Pvt. Ltd., Bangalore)	Uses ultraviolet light to determine the absorbency of a substance. In simple terms, the technique maps the interaction between light and matter and measures. As matter absorbs light it undergoes either excitation or de-excitation, which generates what is known as a spectrum.
11	Spectro fluorophotometer (PL)	RF 5301PC (Shimadzu Analytical India) Pvt. Ltd.)	For measurement of fluorescence fingerprint (EEM), Quantum yield measurement, solid sample measurement. To measure the fluorescent light emitted from a sample at

			different wavelengths, after illumination with a xenon flash lamp. Measurement of Flash Luminescence, Glow Luminescence, UV/VIS Absorbance, UV/VIS Fluorescence, Spectral Scanning and time resolved Fluorescence (TRF), TR-FRET
12	Atomic Emission Spectroscope (AES)	4100MP AES (Agilent Technologies India Pvt. Ltd., Mumbai)	Used for the determination of the elemental composition of substances and in the analysis of trace elements in soils, water, metals, biological specimens, clinical specimens, food, physical evidence such as glass & other solids
13	Atomic Force Microscope (AFM)	Solver (NT-MDT, Russia)	To image the topography of a sample surface by scanning the cantilever over a region of interest of various materials like thin and thick coatings, ceramics, composites, glasses, synthetic & biological membranes, metals, semiconductors, polymers, etc.
14	Double Beam UV Visible Spectrophotometer	U-2900 (Hitachi High Technologies Corporation, Japan)	To determine the amount of light of a specific wavelength absorbed by an analyte in a sample and it performs automatic correction for the loss of light intensity as the beam passes through the sample and reference solution
15	Scanning Probe Microscopy (SPM) with RAMAN Spectroscope	Tri A100 SPM & Raman Isoplane SCT-320, PIXIS 100. (A.P.E. Research Nano Technology, Italy)	To image the topography of a sample surface by scanning the cantilever over a region of interest of various materials like thin and thick coatings, ceramics, composites, glasses, synthetic & biological membranes, metals, semiconductors, polymers, etc. Raman spectroscopy is a qualitative tool for identifying molecules from their vibrations especially in conjunction with infrared spectrometry. Raman spectroscopy can be used to observe other low frequency excitations of the solid, such as Plasmon, magnons and superconducting gap excitations.
16	High Performance Liquid Chromatography (HPLC).	HPLC9300 (YL Instruments, Korea)	Detection of impurities in pharmaceutical industries, water purification, pre-concentration of trace components, ion-exchange chromatography of proteins, to analyze finished drug products and their ingredients quantitatively., for analyzing air & water pollutants.

17	Adhesive Tester	DMT-JKR (Indima Fibres, India)	An adhesion tester is used to ensure the quality of incoming and outgoing goods. It is also used during the product research and development process.
18	Flash Chromatography (FC).	Reveleris X2-UV (Buchi India PVT. Ltd.)	Flash Chromatography (FC) is a chemical separation technique used to purify chemical mixtures. It is used to isolate target compounds from natural products, the fractionation of complex mixture into simpler group for analysis
19	Rheometer	MCR 302 (Anton Paar India Pvt. Ltd., Gurgaon – NCR Delhi.)	It is used to measure rheological properties of various materials. This technique is used to understand the flow behavior of materials (viscosity). It is used to analyze the complex flow characteristics of materials, flow rheology, viscoelastic analysis and phase transition by subjecting a sample to various types of stress such as shear stress and deformation

Testing Charges of Material Characterization Facilities

Sr. No.	Name of Instrument	Measuring capabilities	KBCNMU campus and Affiliated colleges (in Rs./Sample)		Educational Institutes other than KBCNMU/ Govt. R & D Labs (in Rs./Sample)		Industry (in Rs./Sample) Plus 18% GST	
1	FESEM (01 slot = 4 samples)	Ultrafine imaging up to 800k, EDXS	SEM	2000	SEM	4000	SEM	8000
			EDX	500	EDX	1000	EDX	2000
			GOLD Coating	500	GOLD Coating	1000	GOLD Coating	2000
2	XRD	Phase identification Quantitative analysis, Lattice parameter detection, Percentage crystallinity	500		1000		2000	
3	DSC	Melting temp. detection, Glass transition temp., Specific heat, Enthalpy	600		1200		2400	
4	TGA	Degradation temp., Weight loss	500		1000		2000	
5	FTIR (ATR)	Determination of Functional group, Qualitative & Quantitative determination	150		300		600	
6	UV-Visible Spectrophotometer	Qualitative & Quantitative analysis, Determination of percentile comp., Reaction kinetics, Deter. of optical	100		200		400	

		density, absorbance, transmittance, reflectance, etc.			
7	Colour Matching Spectrophotometer	L, a, b values, % strength, k/s Vs Wavelength values & graphs	150	300	600
8	Particle Size Analyzer (DLS)	Average particle size, particle size distribution, Zeta potential	400	800	1600
9	Spectro fluorophotometer	Fluorescent properties	200	400	800
10	Contact Angle	Determination of wettability of materials	250	500	1000
11	Scanning Probe Microscopy	Surface Topography	500	1000	2000
12	Raman Spectroscopy	Raman Properties	250	500	1000
13	Rheometer	Viscosity, Gel strength	400	800	1600
14	Universal Testing Machine for plastics & plastics composites	Tensile strength, Flexural strength, Compressive strength	250	500	1000
15	Limiting Oxygen Index	Flame properties of plastics	250	500	1000
16	Smoke Density Analysis	Smoke density of burning samples	250	500	1000

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