Electrical Characterization

- Probe Station with Temperature IV & CV
- Probe Station High speed Pulse IV ,IV & CV
- Probe Station Ultra low IV & CV
- Probe Station IV & High Frequency Impedance Measurements
- RF Probe Station with 67Ghz Network Analyzer
- Hall Mobility Measurement system

Optical Characterization

- Sol3A class AAA Solar simulator
- FT_IR/Raman spectroscopy
- Multi Probe SPM 4000
- Raman & Micro PL system
- Rigaku XRD for Thin Films
- Rigaku XRD for powder

Micro & Nano Characterization Facility

Centre for Nano Science and Engineering (CeNSE)
Indian Institute of Science

The Micro & Nano Characterization Facility(MNCF) is a fully-staffed, user research facility at Indian Institute of Science(IISc) that offers research convenient and reasonably priced access to a wide range of state of the art analytical instrument & services. The MNCF is 5000sqft precision controlled environment facility housing four distinct labor tries for Electrical, Mechanical, Optical & material characterization. It is a national l facility housing plethora of high end equipment spanning over multiple disciplines of Nano science & engineering rarely found under a single roof.

Mechanical Characterization

- Scanning Acoustic Microscope
- AFM: Dimension ICON
- AFM Agilent 5500
- Micro System Analyze-500,Polytec
- Non Contact Optical Profiler
- Micro UTM
- Micro shaker

Material Characterization

- UHR Dual beam FIB system
- ULTRA 55 FESEM with Mono Cl 4
- ULTRA 55 FESEM with EDS
- Kratos Axis DLD XPS
- ZETA Particle Analyzer

Electrical Characterization

IV , Pulse IV & Impedance Measurements:-

Single setup for Complete Electrical characterization for CMOS,MEMS devices.

- Multiple wafer prober are coupled with wide range of precise measuring equipment with variation in parameters like temperature, which covers immensely wide electrical domain
- Facilities for accurate fast IV and time-domain measurement for a wide range of applications such as pulsed IV, NBTI, and RTS measurement
- IV setup supports high resolution current-voltage (IV) measurement to 0.1fA and 0.5µV
- High accuracy (current measurement to 1nA) and high resolution (0.2% range resolution without averaging).
- Pulse IV setup facility is equipped with system which integrates arbitrary linear waveform generation capability with high-speed IV measurement. With given tool it is possible to generate not only DC, but also various types of AC waveforms (such as pulses, staircase sweeps, and staircase pulsed sweeps) with 10 ns programmable resolution.
- Arbitrary linear waveform generation (ALWG) feature supports the creation of both DC and complex AC waveforms
- Capable of Impedance measurements covering wide frequency domain from 40Hz to 110MHz
- Supports both quasi-static and medium-frequency capacitance-voltage (CV) measurement with Multi frequency capacitance measurement ranging from 1 kHz to 5 MHz with option of listing 21 frequencies in one run.
- Supports accurate fast IV and time-domain measurement for a wide range of applications.
- Supports high voltage pulse generation (up to ±40 V) for high power and memory device testing.
- Each station has 4 SMU (Source Monitor Units), 2VSU (Voltage Source Units) and 2VMU (Voltage Monitor Units).
- Precise measurements of parameters like |Z| (impedance), |Y| (admittance), q (phase), R (resistance), X (reactance), G (conductance), B (susceptance), L (inductance), C (capacitance), Q (quality factor), D (dissipation factor), ESR (equivalent series resistance) and Rp (parallel resistance).
- Impedance measurement range covers from 10 mΩ to 200 MΩ (typical).
- Hall mobility measurements setup also available.
- More than 500 application files with varous parameters extraction possible.
- Arrangement for capturing image & video during mearements.

RF Measurements:-

S-Parameter measurements up to 67Ghz

- Cascade Microtech Summit 9000 Probe station interfaced with Agilent E8361A Performance Network Analyzer
- Upto 6 inch wafers, Leica S6E microscope to view the surface
- Contact substrate for probe alignment and Impedance Standard Substrate (ISS)for the probe calibration
- 94 dB of dynamic range and <0.006 dB trace noise.(Specified to 67 GHz,
- with operation to 70 GHz).26 usec/point measurement speed, 32 channels,
- 16,001 points, TRL/LRM calibration, on-wafer, in-fixture, waveguide, and antenna measurements
- Mixer conversion loss, return loss, isolation, and absolute group delay, Amplifier gain compression, harmonic, IMD, and pulsed-RF.

Mechanical Characterization

Micro System Analyzer

One stop solution for all your MEMS device characterization requirements

- Full-field vibration mapping and broadband, out-of-plane frequency response information, High density sample grids with up to 512 x 512 user-defined measurement Points.
- Submicron laser probe spot for measuring very small structures and details.
- Stroboscopic Video Microscopy for In-Plane Motion Detection, detection up to 1 MHz
- Time-domain displacement measurements with nanometer resolution
- White Light Interferometry for the Acquisition of Topography Data
- Rapid, non-contact 3-D topography measurement with sub-nanometer Resolution

Bruker AFM & Agilent 500 AFM

Classic AFM imaging and other cutting edge modes for thorough atomic scale characterization

- ContactMode,TappingMode,PhaseImaging,ScanAsyst, HarmoniX,PeakForceQNM, LiftModeTM,Dark Lift,Nano-I ndentation,Nanolithography,Force Volume,Piezo Response,Force Modulation ,Lateral Force Microscopy (LFM),Magnetic Force Microscopy (MFM),Electric Force Microscopy (EFM),Surface Potential ,Scanning Capacitance Microscopy (SCM),Scanning Spreading Resistance ,Microscopy (SSRM),Conductive Atomic Force Microscopy (CAFM),Scanning Tunneling Microscopy (STM).

Scanning Acoustic Microscope

Non destructive high resolution sub-layer ultrasonic imaging

- Avialable transducer:-50,100,150,230MHz.
- Scanning modes: A, B, C, D, 3D, seqence,
- auto , p(profile) and X-scan,
- HQ, FFT, B-scan with quantitiative
- Measurement.
- Material spectrocpoy through acosutic iimpedance analysis.
- Maximun scan area 400*400mm.

Non contact optical profiler

Sub-nanometric 3D non contact profiling for in-depth surface morphology analysis

- For the measurement of non-contact surface roughness, step-heights, form, shape, angular and critical dimension results. The TalySurf CCI is an advanced 3-dimensional non-contact optical metrology tool used for advanced surface characterization. These instruments have the ability to offer a true topographical representation of a surface with 0.01 nm Z resolution over a full scan range plus a 0.4 nm lateral resolution, with over 1,000,000 data points.
- All material types are measurable including: glass, liquid inks, photo resist, metal, polymer and pastes.
- Advanced optical interferometry
- 2.2 mm ver tical range with closed loop piezoless Z axis scanner
- New improved X, Y and Z stitching, up to 100 mm measurement range
- 1048 x 1048 pixel array for large FOV with high resolution
- Increased angle sensitivity giving better data quality
- Virtual elimination of measurement uncertainty
- <0.2 Angstrom RMS repeatability, <0.1% step height repeatability
- 0.1 Angstrom resolution over the entire measurement range
- FEA optimised mechanical design for excellent R&R capability
- Calibration utilizing ISO standards ensures acceptance of results

Micro UTM

Strength of material analysis down to the micron scale

- Studies like Tensile, strain measurements can be done over wide range
- Of fields, few like mentioned below :-
- Adhesives - Biomaterials - Biomechanics -Ceramics - Chords Composites -- Electronic Components and Materials - Films - Foam -Gasket Material -Glass - Labels - Medical Devices - Metals -Paper Products -Plastics - Rubber - Seals, Te
- xtiles - Wire etc

Optical Characterization

Raman and MicroPL System

fast, non-destructive chemical analysis of solids, powders, liquids, and gases

- High spectral resolution of 0.3 cm-1 , high spatial resolution of 1 µm, integrated confocal microscope, multiple laser coupling: 325nm and 514.5nm (266nm, 785nm and 830nm in near future), multiple detector for long spectral range covering UV-Vis-NIR : 290nm to 1700nm, low frequency Raman spectroscopy down to 50 cm-1 .
- Raman and Photoluminescence spectroscopy, Resonance Raman, Surface enhanced Raman, Raman mapping (material, phase, strain etc), photoluminescence (PL) mapping, IR-PL.
- Characterisation of carbon materials
- Strain measurements
- Raman/PL imaging
- Determination of composition and phase
- Band gap determination
- Material Quality
- Impurity levels and defect detection

Solar Simulator

Solves all your solar cell characterization requirements!

- Output beam sizes 2x2", 4x4", 6x6" , 8x8", and 12 x 12"
- Factory certified Class AAA CW systems
- Calibration certificate validating Class AAA performance for all 3 standards: IEC, ASTM and JIS
- Long-lived, highly reliable instruments designed specifically for 24/7 production environments
- Non-reflective black finish reduces stray light
- Temperature sensors and interlocks ensure operator safety
- Improved optical design for maximum spatial uniformity
- Improved working distances accommodate larger samples
- Efficiency of solar cells
- Photochemistry for testing exposure to sun light
- Material degradation research
- Sun light exposure testing and material stability studies for textile, plastics and paints
- Qualifying and life-time testing of materials for space
- Photobiology research of cells
- Accelerated testing for cross-linking of polymers
- Embrittlement of plastics

FT/IR

FT-IR Spectrometers for measuring all IR frequencies simultaneously presenting the desired spectral information for analysis.

- Dynamic Alignment ensuring exceptional high-resolution line shapes,USB 2.0 interface,Pinned-in-place components ensuring stability, and user swappable components.
- Full integration with the OMNIC software, allowing the user to focus on their studies. Configurable for multiple spectral ranges (far-IR to UV-Vis)
- Performs time-based studies, Rapid scans and low-light level measurements
- Five external beam options
- Wide selection of detectors
- Materials evaluation and identification:
- Organic compounds,Structure of many inorganic compounds,Deformulations
- Forensics,Material homogeneity
- Failure analysis:
- Micro-contamination identification, Adhesive performance, Corrosion chemistry, Quality control screening, sample comparison, Emission spectra, Photocurrent spectra

SPM-NSOM

Powerful tool capable of simultaneous AFM-SNOM and many other scanning modes

- Independent scanning of up to four probes for atomic force, near- field optical and probes for scanned probe imaging modes.
- Unique probes for multiple probe resistance measurements with two, three and four point probe geometries
- Unique thermal probes for multiple probe measurements
- Multiple probe near-field optical (NSOM or SNOM) measurements
- Multiple probe nanochemical writing on a variety of structures with a variety of gaseous, liquid or solid inks with Fountain Pen Nanochemistry™
- Multiple probe nanoindentation with on-line ultra high resolution atomic force imaging of the indented structure
- Multiple probe optical or thermal desorption with tandem collection for mass spectral analysis.
- SPM Modes of Operation AC Mode, All Standard AFM Modes of Operation with On-line Probe or Sample Scanning Feedback Mechanism Tuning Fork Standard, Special Beam Bounce Attachment .
- Thermal and Resistance Profiling Contact or AC mode,No Feedback Laser Induced Extraneous Carriers in Semiconductors with AC mode Near-field Transmission, Reflection, Collection, Illumination Optical Imaging & Illumination .Differential Interference Contrast Reflection and Transmission ,Refractive-Index Profiling Reflection and Transmission .

XRD (thin film and powder)

Xray diffraction system for powder and thin film phase identification

- X-ray diffraction systems for phase identification.
- Thin film attaachment for thin samples and coatings

Materials Characterization

SEM with EDS and MonoCl Attachements

Ultra high resolution scanning electron imaging coupled with material spectroscopy tools

- Fully integrated EsB detector for compositional information
- Low kV BSE imaging at short working distance: WD = 1mm
- Ultra-stable high-beam current for analytical applications up to 100 nA @ 0.2%/h
- GEMINI technology with high efficiency In-lens detector for high contrast topographic imaging
- No magnetic field at the specimen level
- Superb resolution and image quality at high and low operating voltages
- Extremely wide operating voltage range from 0.02-30kV
- Beam current up to 100 nA
- Sub-nm resolution at 15 kV
- Local Charge Compensator in ULTRA PLUS for imaging of non-conductive specimen
- Panchromatic and monochromatic imaging with high spatial and spectral resolution
- 'Point and click' selection of spectroscopy, imaging and mapping modes
- Shortpass, longpass and bandpass imaging using filter options for increased flexibility

UHR DUAL BEAM FIB

Powerful electron and ion beam tool for imaging, patterning and precise TEM sample preparation

- Electronics3D Metrology
- Defect & Failure Analysis
- TEM Lamella Preparation
- Materials Science Prototyping for MEMS and NEMS
- Nanometrology of Critical Dimensions at the Nanoscale
- High Quality Sample Preparation Using Focused Ion Beams
- Natural ResourcesCuttings, Drill Cores, and Plugs
- Electron beam resolution @ optimum WD (0.8 nm at 30
- kV (STEM), 0.9 nm at 15 kV, 1.4 nm at 1 kV)
- • Electron beam resolution @ coincident point (1.0 nm at
- 15 kV, 1.6 nm at 5 kV, 2.5 nm at 1 kV)
- • Ion beam resolution @ coincident point (4.5 nm at 30 kV
- using preferred statistical method (2.5 nm at 30 kV using
- selective edge method Maximum horizontal field width.

ZETA Particle Analyzer

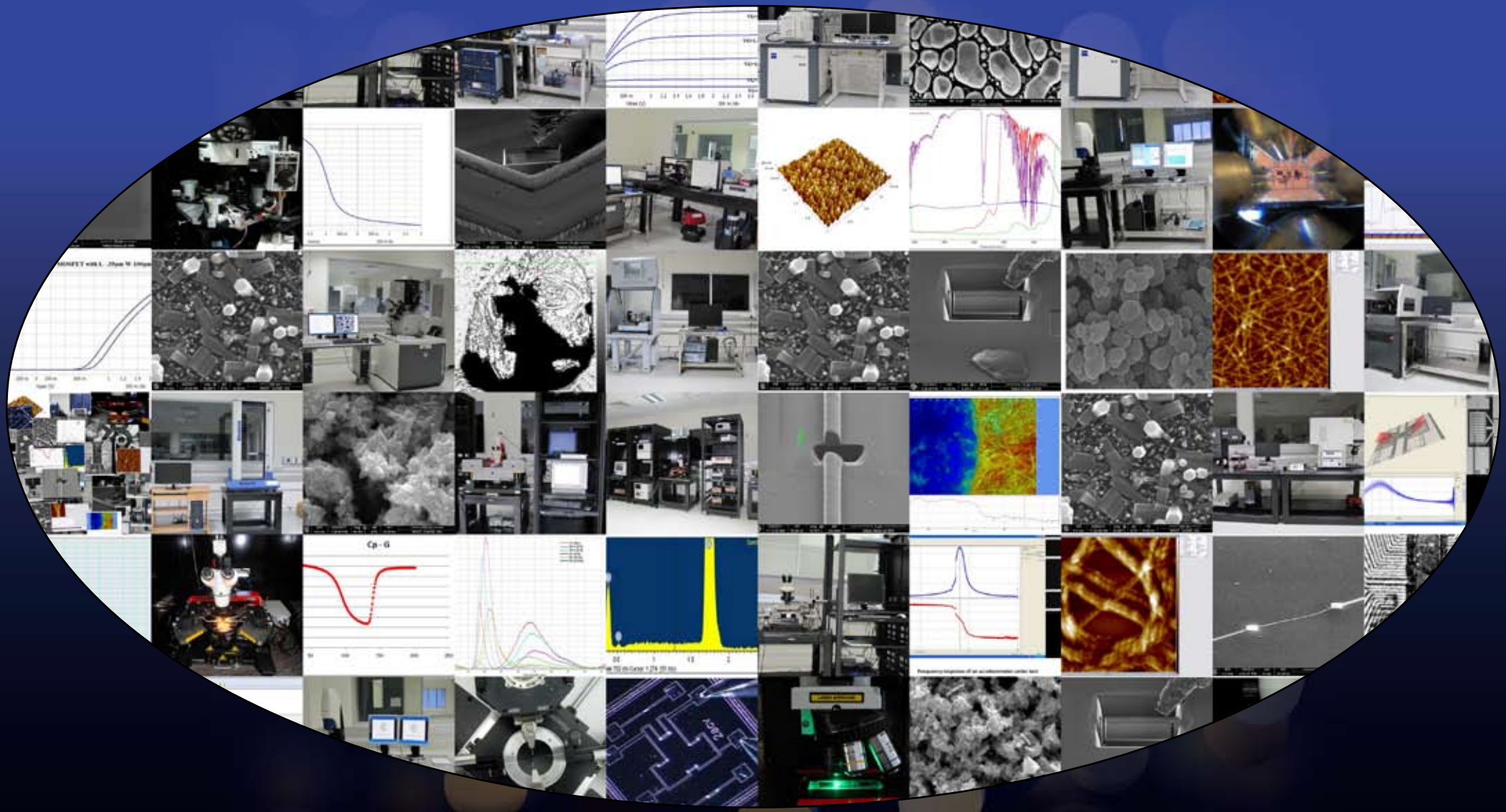
Advanced nanoparticle analysis tool

- Low mobilities measurement, the Brookhaven ZetaPALS is the answer. The coincidence point potential using Phase Analysis Light Scattering: A technique that is up to 1,000 times more sensitive than traditional light scattering methods based on the shifted frequency spectrum. Electrostatic repulsion of colloidal particles is often the key to understanding the stability of any dispersion. A simple, easy measurement of the electrophoretic mobility "even in information. Measurements made in water and other polar liquids are easy and fast with the Brookhaven ZetaPlus. Such measurements cover the range of typically mobilities of ± 0.5-8x10-8 m2 /V·s.
- Zeta Potential : Size range suitable for measurement 1 nm to 100
- Mobility range: 10-11 to 10-7 m2/V*s
- Zeta potential range : -220 mV to 220 mV (*)
- Maximum sample concentration : 10% v/v (*)
- Sample volume : 180 L, 600 L, 1250 L
- Maximum sample conductivity: 30 S/m
- Signal processing : Phase Analysis Light Scattering, PALS
- Particle Size : Size range (radius) <0.3 nm to >3 microns (*)
- Sample volume : 10 L, 40 L, 1 - 3 mL
- Concentration range : 0.1 mg/mL to 10% v/v (*)

XPS

XPS tool for materials identification and analysis, and advanced studies

- Spectroscopy and imaging modes available
- Exceptional small spot capabilities (15 micron)
- Charge neutralization feature for insulating samples
- Quantitaative chemical imaging of surfaces



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