

**YOUR CHALLENGES +
OUR EXPERTISE**

= INNOVATIVE SOLUTIONS

The Emerging Technologies Research Centre
Expert Facilities for the Production
and Characterisation of Electronic
Materials and Devices

EMTERC's activities are in the areas of micro and nano electronics. These range from fundamental materials research (fabricating novel materials, understanding basic physical mechanisms), to investigating device applications in power electronics and display technologies.

Since its inception in 1995, the Centre has collaborated actively with both academia and industry at national and international level. In support of all the varied work undertaken, the Centre has a wide variety of facilities and equipment which can be broken down into metrology, electrical characterisation and fabrication.

There are four areas where we can offer services to your organisation. These areas are:

- Surface analysis
- Thin film Characterisation
- Electrical and thermal characterisation of materials, electron devices and circuits
- Material deposition

In this document you can find details of these services and equipment available at EMTERC.

Surface analysis

We can analyse morphology as well as electrical properties of the surface using the following equipment:

- Park XE 100 Atomic force microscope and scanning probe microscope (AFM/SPM)
- KLA Tencor alphastep 200 profilometer

The AFM/SPM is a high accuracy instrument and technique that can fulfil the needs of nanoscale metrology of small samples in data storage, semiconductors, nanoscience, materials science and polymers. It offers seven different modes supported by experience professional staff and provides a comprehensive suite of analytical techniques:

- Contact atomic force microscopy (AFM)
- Scanning capacitance Microscopy (SCM)
- Conductive AFM (I-AFM)
- Scanning tunnelling microscopy (STM)
- Magnetic force microscopy (MFM)
- Electric force microscopy (EFM)
- True non-contact atomic force microscopy (NC-AFM)

The profilometer is a non-destructive, easy-to-use device for step measurement and surface profile investigation. A diamond-tipped stylus is in direct contact and is scanned across the surface giving robust step-height measurement with a resolution of $\pm 5\text{\AA}$.

Thin Film Characterisation

Various material properties can be measured using the following equipment located within EMTERC:

- Ellipsometer – Rudolph AutoEL III
- Transmission electron microscope (TEM), JEOL 200CX
- Scanning electron microscope (SEM), LEO SEM 430
- UV/Vis Spectroscopy

Electrical and Thermal Characterisation of Materials, Electron Devices and Circuits

Current-Voltage measurements of wafer-level/ packaged devices and thin films. Capacitance-Voltage measurements of thin films, e.g. analysis of novel dielectric materials using testing facilities located in EMTERC:

- 8 inch Karl Suss probe station – Femto-ampere accuracy
- 8 inch high-temperature measurement up to 450°C
- 4 inch wafer level switching system up to 150°C
- Various HP/Agilent, Keithley characterisation tools including: voltage and current sources and monitors; LCR bridge and switching matrix. A 4-Channel 600 MHZ Lecroy oscilloscope with a high power current probe

Material Deposition

We have extensive clean room facilities for back end processing in EMTERC including:

- PECVD/RIE Systems and RF/DC magnetron sputtering
- Thermal evaporators
- Dipping and spin coating equipment
- Langmuir – Blodgett trough for molecular layer deposition

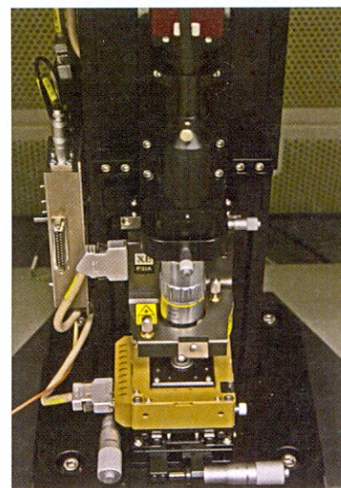
We have optimised processes for the deposition of a number of metal organic and inorganic materials and can provide commercial-quality materials deposited onto a substrate of your choice. Examples of the material we can deposit include:

- Metals: AL, NI, AU, AG, W, MO, CR, TI etc.
- Semiconductors: Silicon nitride (SiN), Amorphous silicon (A-Si:H), ZINC OXIDE
- Conducting ITO

Instruments Specification

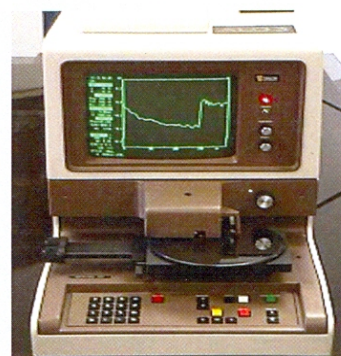
Scanning Probe Microscope (SPM) – PARK systems XE 100 SPM

- Scan modes: AFM, NC-AFM, I-AFM, STM, MFM, EFM, SCM
- Scan range:
 - XY-scanner: 50 μm
 - Z-scanner: 12 μm
- Amplitude detection resolution $< 0.1 \text{ nm}$
- Sample size:
 - Up to 100 mm $\times$ 100mm
 - Up to 20 mm thick
 - Up to 500 g
- Hermetically sealed enclosure
- Temperature controlled stage:
 - -10°C to 180°C



Profilometer – KLA Tencor AlphaStep200

- Scan range:
 - Length 80 – 2000 μm
 - Height 200 Å – 160 μm
- Height resolution: 5 Å
- Variable stylus force for soft film measurements ($< 5 \text{ mg}$)
- Automatic averaging capability



Ellipsometer AUTOEL III

- Single Laser: 632.9 nm.
- Angle range: 60° to 90°.
- Typical Resolution:
 - between 3–10 Å for film thickness
 - 0.01° for refractive index
- Maximum sample size:
 - 15.2cm × 15.2cm
- Optical constants of bare material, single and double layer transparent films



Transmission Electron Microscope (TEM) – JEOL 200CX

- Resolution
 - 1.4 Å lattice
 - 3.5 Å point to point
- Accelerated voltage 80–200 keV
- Magnification
 - 600–450,000 Standard
 - 6000–120,000 selected area
 - 100–600 Low magnification
- Selected area electron diffraction 160–2330 mm
- High dispersion diffraction 3.4–55 m



Scanning Electron Microscope (SEM) – Leo SEM 430

- Acceleration voltage: 300 V to 30 kV
- Electronic beam current: 1 pA to 1 μA
- Magnification: 15 to 300,000
- Resolution: 4 nm
- Specimen chamber: 300 × 265 × 190 mm
- X and Y stroke: 100 mm X, 125mm Y; Z stroke: ± 15 mm
- Tilt: 0 to 90°; Rotation: 360°
- Working vacuum: 10⁻⁴ to 10⁻⁶ torr



For further information on these facilities
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ADD DMU. PROFIT FROM OUR EXPERTISE