A PLATFORM FACILITATING IDEAS AND INNOVATIONS

The SERC (Science and Engineering Research Council) Nano Fabrication, Processing and Characterisation (SnFPC) platform aims to make the extensive research facilities at the Agency for Science, Technology and Research (A*STAR) accessible to all researchers. The facility at the A*STAR Institute of Materials Research and Engineering (IMRE) forms the hub of a wide network and provides easy access to a wide range of micro/nano fabrication and material characterisation techniques and the related expertise.

SnFPC AT IMRE

The SnFPC group manages the maintenance and operation of the relevant IMRE facilities, and encourages researchers from other organisations to base associated research projects here. The IMRE facilities include a large clean room which is purpose-built for research work into a variety of different materials, and an impressive range of major equipment.

SnFPC employs dedicated staff that are trained and experienced in the use of its specialist equipment. These staff are on hand to train and assist new users of such facilities, offer the service of baseline processes and characterisation as well as to contribute in research projects whenever necessary.

SnFPC is fully committed to provide efficient and excellent quality service in nanofabrication and material characterisation.

SCOPE AND OBJECTIVES

• SnFPC encompasses a network of world-class facilities and expertise from across the SERC Research Institutes.

• SnFPC offers an extensive range of characterisation, nano fabrication services and advice to all parties across Singapore.

• The range of baseline fabrication processes offered by SnFPC is constantly being updated through the results of research projects across the SnFPC user community.

• The dedicated facility staff are highly trained in the use of the equipment and its associated processes.

• The SnFPC staff contribute as team members in research projects, for consultancy or service work or to train new users on the equipment.
LIST OF FABRICATION EQUIPMENT

Deposition
- Plasma Enhanced Chemical Vapor Deposition System (Unaxis), Nextral ND200
- Low Pressure Chemical Vapor Deposition System (Centrotherm), E1200 HT 260-4
- RF/DC Sputtering System 1 (Denton), Discovery 18
- RF/DC Sputtering System 2 (Denton), Discovery 18
- Unbalanced Magnetron Sputtering System (Nanofilm)
- E-Beam Evaporator 1 (Edwards), Auto 306
- E-Beam Evaporator 2 (Edwards), Auto 306
- E-Beam Evaporator 1 (Denton), Explorer
- E-Beam Evaporator 2 (Denton), Explorer

Dry Etching
- Inductive Coupled Plasma Etching System (Unaxis), Shuttle Lock Reactor SLR-7701-8R
- DRIE/ICP Etcher (Oxford), Plasmalab ICP 180
- RIE II Etcher (Oxford), Plasmalab 80plus
- RIE I Etcher (Trion), SIRUS
- Reactive Ion Etcher (Trion), Sirus T2
- UV & Ozone Dry Stripper (Samco), UV-1
- XeF2 Silicon Dry Etching System (Xactix), Xetch e1

Patterning
- E-beam Lithography System (Elionix), ELS-7000
- Optical Laser Writing Tool (Heidelberg), DWL66FS
- Laser Pattern Generator (Heidelberg), DWL2000
- Mask & Bond Aligner (SUSS MicroTec), MAB/BA6
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- HMDS/Image Reversal Oven (YES), 310TA

Annealing
- Rapid Thermal Processing System (Jipelec), JetFirst 150
- Conventional Furnace, Thermcraft

Metrology
- Surface Profiler (KLA Tencor), P-10
- Surface Profiler (KLA Tencor), P16+
- Thin Film Stress Measurement System (FSM), 500TC

Backend Process
- Dicing system (Disco), DAD321
- Laser Processing System (ESI), S2000
**LIST OF CHARACTERISATION EQUIPMENT**

**Deposition**
- Transmission Electron Microscope (Philips), FEI CM300
- Transmission Electron Microscope (JEOL), JEM 2100
- Scanning Electron Microscope (JEOL), JSM-5600
- Field Emission Scanning Electron Microscope (JOEL), JSM-6700F
- Thermal Field Emission Scanning Electron Microscope (JEOL), JSM-7600F
- Dual beam Focused Ion Beam (FEI), Helios Nanolab 450S
- Dual beam Focused Ion Beam (FEI), Helios Nanolab 600
- Atomic Force Microscope (Bruker), Dimension Icon
- Multimode AFM (Veeco), DI NanoScope IV

**Surface Analysis**
- X-ray Photoelectron Spectroscopy (ESCALab), VG 220i-XL
- X-ray Photoelectron Spectroscopy (ThetaProbe), A1113
- Time-of-Flight Secondary Ion Mass Spectroscopy (ION), TOF SIMS IV

**X-ray Analysis**
- General Area Detector Diffraction System (Bruker), GADDS
- High Resolution X-Ray Diffraction System (Panalytical), XPert MRD Pro
- Single Crystal X-ray Diffractometer (Bruker), Kappa APEX DUO
- Micro X-Ray Fluorescence Spectrometer (Bruker), M4 Tornado

**Spectroscopy**
- Variable Angle Spectroscopic Ellipsometer (JA Woollam), WVASE32
- Infrared Variable Angle Spectroscopic Ellipsometer (JA Woollam), IR-VASE®
- Microspectrophotometer (CRAIC), QDI 2010
- UV-VIS-NIR Photospectrometer (Shimadzu), 3101

**Mechanical Analysis**
- Servohydraulic Universal Tester (Instron), 8872
- Single Column Universal Tester (Instron), 5543
- Double Column Universal Tester (Instron), 5569
- Microforce tester (Instron), 8848
- Impact tester (Instron), Dynatup 9250HV
- Nanoindentation system (UMIS), 2000H
- Nanoindentor (Agilent), G200
- Nano-mechanical Probe (MTS), Nano XP
LIST OF CHARACTERISATION EQUIPMENT (Continued)

**Electrical Analysis**
- Hall Equipment (Accent), HL5500

**Thermal Analysis**
- Photo Differential Scanning Calorimeter (TA Instruments), DSC Q100
- Differential Scanning Calorimetry (Mettler Toledo), DSC1
- Thermo Gravimetric Analyser (TA Instruments), TGA Q500
- Dynamic Mechanical Analyzer (TA Instruments), DMA Q800
- Thermo Mechanical Analyser (TA Instruments), TMA Q400
- Thermal Gravimetric Mass Spectrometry (Netzsch), TG 209 F1 Libra- QMS 403C
- Simultaneous Thermal Analyzer (Netzsch), STA 449 F1 Jupiter
- Simultaneous DSC-TGA (TA Instruments), SDT 2960
- Dielectric Thermal Analyzer (Lacerta Technology), DETA DS6000
- Laser Flash Apparatus (Netzsch), LFA 457
- Heat Flow Meter (Netzsch), HFM 436

**Chemical Analysis**
- Nuclear Magnetic Resonance Spectrometer (Bruker), DRX 400MHz
- Nuclear Magnetic Resonance Spectrometer (Varian), 400MHz
- Gas Chromatography Mass Spectroscopy (Varian), GC3800 & MS4000
- Liquid Chromatography Mass Spectrometer (Shimadzu), LCMS-IT-TOF®
- Thermo Gravimetric Analyzer coupled with Infrared Spectroscopy (Perkin Elmer), TGA 7 & (Bruker), Vertex 80
- Fourier Transform Infrared Spectroscopy (Perkin Elmer), Spectrum 2000
- Micro- Fourier Transform Infrared Spectroscopy (Perkin Elmer), Autoimage
- Elemental Analyzer (Flash), FLASH EA 1112
- Inductively Coupled Plasma Mass Spectroscopy System (Agilent), ICP-MS 7700X

**Rheology and Others**
- Abbe Refractometer (Atago), NAR-IT solid
- Force Tensiometer (KSV Sigma), 701
- Capillary Viscometer (LAUDA), Automatic Ubbelohde
- Cone/Plate Rheometer (Brookfield), LVDV-II+ PRO
- Water permeation system (Mocon), PERMATRAN-W 33/33
- Surface Area and Porosity Analyzer (Micrometrics), ASAP 2020
- Gel Permeation Chromatography (Waters), Waters 2690 & 2420
- High Temperature Gel Permeation Chromatography (Agilent), PL GPC 220 Integrated GPC system
ABOUT IMRE

At the A*STAR Institute of Materials Research and Engineering (IMRE), we are committed to high-quality, extensive materials research and development to bring about the latest in innovation and technology. We stand by the importance of materials research, which represents a vital platform for building Singapore’s competitive advantage in a knowledge-based economy.

Established in 1997, IMRE undertakes research in selected fields of materials science and engineering, including optoelectronics, nanomaterials, chemicals, and polymers. Our new innovations and discoveries are constantly being explored to help further the applications of advanced materials and processes.

IMRE is a member of the Agency for Science, Technology and Research (A*STAR), and is closely linked with the National University of Singapore (NUS) and Nanyang Technological University (NTU). We develop core competence and interdisciplinary teams in critical technology areas, enabling fundamental new discoveries, the development of advanced materials that lead to new commercial products, and the transformation of various technologies.

Partnering international organisations, research institutes and industry in a synergistic, multidisciplinary and collaborative approach to materials research further fulfils IMRE’s vision to be the leading research institute for materials science and engineering.