RESEARCH AND INNOVATION CENTER FOR
GRAPHENE AND 2D MATERIALS · RIC2D

Laboratory Services Catalogue

Advanced materials characterisation, processing
and fabrication capabilities for industry and research partners

Khalifa University of Science and Technology · Abu Dhabi, United Arab Emirates
2026 Edition

Access Our Laboratories as a Service

The Research and Innovation Center for Graphene and 2D Materials (RIC2D) at Khalifa University operates a comprehensive suite of advanced characterisation, processing and fabrication laboratories in Abu Dhabi. Through our laboratory services programme, industrial partners, start-ups and research organisations can access these capabilities directly, without the capital investment of establishing equivalent facilities in-house.

All analyses and processes are performed by RIC2D's own laboratory staff: PhD-level specialists with decades of combined hands-on experience across the full instrument suite. Clients submit their samples together with a description of the properties of interest, and receive documented results delivered as a formal report. This model ensures consistent measurement quality, full traceability and correct instrument operation on every engagement.

This catalogue presents the instruments available as a service, organised by capability area. Each entry summarises the technique, its typical application fields, the analyses offered and indicative instrument durations per sample or session.

Specialist-Operated Service

Every measurement and process is carried out by RIC2D's resident specialists, each holding a doctorate and acting as technical custodian of their instruments. No client training or instrument familiarity is required.

Documented Deliverables

Results are returned as a formal report covering methodology, instrument configuration, measurement conditions and data, suitable for internal engineering use, quality records and third-party submission.

Analysis durations shown in this catalogue are indicative and refer to typical instrument time per sample or session. Actual durations, sample requirements, deliverables and scheduling are confirmed at the quotation stage. Instruments marked **Coming Soon** are in commissioning and will be released for service upon completion of qualification.

53	8	PhD
instruments available	capability areas	specialist operators

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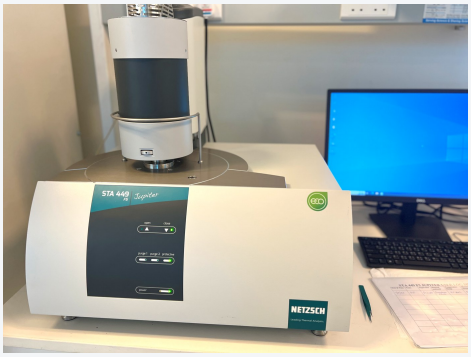
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Thermogravimetric Analyser (TGA)

Thermogravimetric Analysis

Instrument: NETZSCH STA 449 F5 Jupiter

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The TGA system measures mass changes of materials as a function of temperature and time under controlled atmospheres. It provides thermal stability, decomposition profiles, oxidation behaviour and compositional analysis, which are critical for materials development, polymer engineering, composites, battery materials and quality control.

Typical Applications

- Polymer and composite stability assessment (decomposition temperature, residual content)
- Battery material evaluation (solid electrolyte thermal stability)
- Metal oxide and ceramic processing (phase transitions, mass loss behaviour)
- Quality control for industrial materials (filler content, moisture analysis)

Services and Indicative Durations

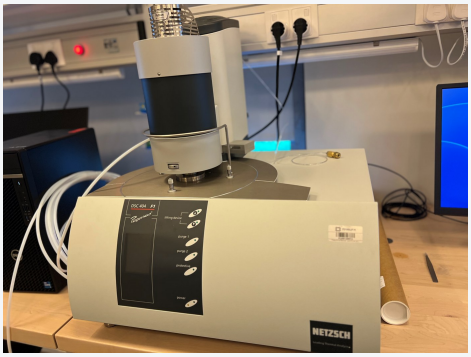
Analysis / result delivered	Indicative instrument duration
Thermal stability and decomposition temperature	1.0–1.5 h
Mass loss profile and residue quantification	1.0–1.5 h
Material compositional analysis	2.0–3.0 h
Multi-step decomposition analysis	1.5–2.5 h

Differential Scanning Calorimeter (DSC), High Temperature

Differential Scanning Calorimetry, room temperature to 1000 °C

Instrument: NETZSCH DSC 404 F1 Pegasus

Technical custodian: Dr. Ahmed O. Yusuf



Overview

DSC measures heat flow associated with transitions in materials, including melting, crystallisation, glass transitions, phase changes and thermal capacity. It is essential for polymer processing, thermal stability assessment, pharmaceutical formulations and material certification. Temperature range: room temperature to 1000 °C.

Typical Applications

- Polymer melt and crystallisation studies (melting point, crystallinity)
- Glass transition temperature (Tg) determination for composites and films
- Thermal behaviour of pharmaceuticals (purity, stability)
- Phase change material (PCM) evaluation

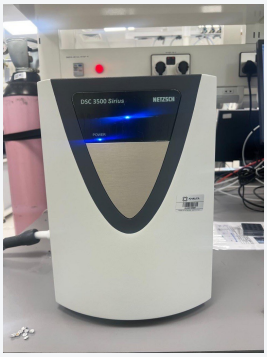
Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Melting and crystallisation temperatures	1.0–1.5 h
Glass transition temperature (Tg)	1.0–1.5 h
Reaction enthalpies (endothermic and exothermic)	1.0–2.0 h
Specific heat capacity (Cp)	1.5–2.0 h

Differential Scanning Calorimeter (DSC), Low Temperature

Differential Scanning Calorimetry, -160 ºC to 600 ºC

Instrument: NETZSCH DSC (low temperature configuration)
Technical custodian: Dr. Ahmed O. Yusuf



Overview

DSC measures heat flow associated with transitions in materials, including melting, crystallisation, glass transitions, phase changes and thermal capacity in the sub-ambient regime. Operating range from −160 °C to 600 °C makes it suitable for elastomers, low-temperature polymers and phase change materials.

Typical Applications

- Polymer melt and crystallisation studies (melting point, crystallinity)
- Glass transition temperature (Tg) determination for composites and films
- Thermal behaviour of pharmaceuticals (purity, stability)
- Phase change material (PCM) evaluation

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Melting and crystallisation temperatures	1.0–1.5 h
Glass transition temperature (Tg)	1.0–1.5 h
Reaction enthalpies (endothermic and exothermic)	1.0–2.0 h
Specific heat capacity (Cp)	1.5–2.0 h

Simultaneous TGA/DSC with 24-Position Autosampler

Simultaneous Thermogravimetry and Differential Scanning Calorimetry



Instrument: Mettler Toledo TGA/DSC 3+ STARe System

Technical custodian: Dr. Ahmed O. Yusuf

Overview

The Mettler Toledo TGA/DSC 3+ STARe System combines TGA and DSC to measure mass change and heat flow events under controlled temperature and atmosphere. It is used to study thermal stability, decomposition, oxidation, moisture and solvent loss, melting, crystallisation and material composition, with high-temperature options up to 1600 °C depending on configuration. The integrated autosampler runs up to 24 samples in sequence.

Typical Applications

- Polymers and plastics (thermal stability, melting and crystallisation, filler or ash content)
- Pharmaceuticals (solvent loss, hydrate and solvate behaviour, polymorphism, decomposition temperature)
- Nanomaterials and composites (organic content, residual mass, oxidation stability)
- Catalysts and inorganic materials (moisture loss, decomposition, carbonate and oxide formation)
- Environmental and biomass samples (moisture, volatile matter, combustion behaviour, ash residue)

Services and Indicative Durations

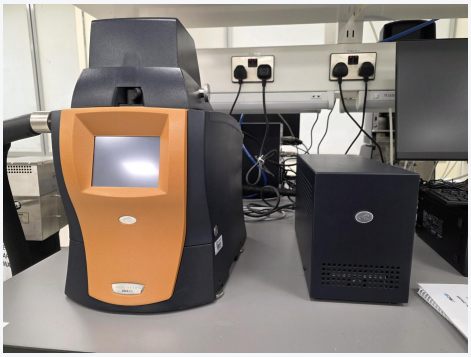
Analysis / result delivered	Indicative instrument duration
Mass change vs temperature and time (weight loss, moisture, volatile content, decomposition steps)	1–3 h
Thermal transitions and heat flow (melting, crystallisation, glass transition, enthalpy changes)	1–2 h
Thermal stability and degradation (onset temperature, residue and ash content, oxidation stability)	2–4 h
Reaction and decomposition kinetics (kinetic parameters, stability comparison under different atmospheres)	4–8 h

Thermal Conductivity Meter

Steady-State Thermal Conductivity Measurement

Instrument: DTC 300 – TA Instruments

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The DTC 300 measures thermal conductivity and thermal resistance of solid materials using the steady-state comparative method. It is essential for evaluating heat dissipation in electronics packaging, building insulation, polymer composites and thermal interface material qualification.

Typical Applications

- Electronic packaging and thermal management (thermal conductivity of substrates and encapsulants)
- Building and insulation materials (steady-state thermal conductivity of foams and panels)
- Polymer and composite thermal characterisation (heat dissipation in filled polymer systems)
- Thermal interface material (TIM) qualification (grease, pad and adhesive performance)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Thermal conductivity (steady-state method)	1.0–2.0 h
Thermal resistance measurement	1.0–2.0 h
Contact resistance evaluation	1.5–2.5 h
Temperature-dependent thermal conductivity	2.0–4.0 h

Laser Flash Analyser, Thermal Conductivity and Diffusivity

High-Temperature Laser Flash Analysis

Instrument: NETZSCH LFA 467 HT

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The NETZSCH LFA 467 HT is a high-temperature laser flash analyser used to measure thermal diffusivity and calculate thermal conductivity of solids, supporting advanced materials research and high-temperature process design applications.

Typical Applications

- Thermal diffusivity and thermal conductivity determination of solid materials
- High-temperature materials research (thermophysical properties under extreme temperatures)
- Energy conversion materials and thermal barrier coatings (TBCs)
- Nuclear and aerospace materials exposed to thermal stress
- Polymers and advanced lightweight composites

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Thermal diffusivity	5–10 h
Thermal conductivity	5–10 h
Specific heat capacity	5 h
Thermal stability at high temperature	10–100 h
Thermal transport behaviour	10 h

Thermoelectric Analyser

Simultaneous Seebeck Coefficient and Electrical Conductivity Measurement

Instrument: NETZSCH SBA 458 Nemesis

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The NETZSCH SBA 458 Nemesis is a thermoelectric measurement system designed to simultaneously determine the Seebeck coefficient and electrical conductivity of materials at high temperatures, enabling accurate evaluation of thermoelectric performance and material efficiency.

Typical Applications

- Thermoelectric material research (materials for waste heat recovery, e.g. automotive exhaust systems)
- Energy harvesting devices (conversion of industrial waste heat into electrical power)
- Semiconductor research (transport properties of doped semiconductors for high-temperature electronics)
- Materials development and optimisation (novel alloys and ceramics for improved thermoelectric efficiency)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Seebeck coefficient	4 h
Electrical conductivity	4 h
Electrical resistivity	4 h
Power factor ($S^2\sigma$)	5 h

BET Surface Area and Porosity Analyser

Nitrogen Adsorption–Desorption Analysis

Instrument: NOVA 800 – Anton Paar

Technical custodian: Dr. Ahmed O. Yusuf



Overview

BET analysis calculates the specific surface area and pore structure of materials via nitrogen adsorption–desorption isotherms. This is crucial for catalysts, adsorbents, nanomaterials, porous ceramics and battery materials.

Typical Applications

- Catalyst development (surface area for active sites)
- Battery and energy storage materials (pore size distribution)
- Adsorbents and filtration media characterisation
- Nanomaterials and porous ceramics

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
BET surface area (including degassing)	3–6 h
Pore size distribution	4–6 h
Total pore volume	4–6 h
Adsorption and desorption isotherm analysis	4–6 h

High-Performance Gas Adsorption Analyser

Multi-Sample BET Surface Area and Gas Adsorption Analysis

Instrument: Microtrac BELSORP MAX X

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The Microtrac BELSORP MAX X is a high-performance gas adsorption analyser for simultaneous multi-sample measurement of specific surface area, pore volume and pore size distribution. It covers microporous to macroporous materials with high precision across a wide relative pressure range using nitrogen and other probe gases.

Typical Applications

- Catalyst surface area and pore structure analysis (BET surface area and total pore volume)
- Battery and energy storage materials (activated carbon, MOF and electrode pore characterisation)
- Adsorbents and membrane characterisation (pore size distribution in zeolites and silica)
- Nanomaterials and porous ceramics (t-plot micropore analysis and BJH mesopore distribution)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
BET specific surface area	1.0–3.0 h
Total pore volume and average pore size	1.0–3.0 h
BJH pore size distribution	1.5–4.0 h
t-Plot micropore analysis	2.0–6.0 h

Capillary Flow and Liquid-Liquid Porometer

Gas–Liquid and Liquid–Liquid Porometry

Instrument: Innova PoreTech Porometer

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The porometer determines pore size distribution, mean pore diameter and permeability in porous materials using gas–liquid or liquid–liquid displacement techniques. These measurements are essential for verifying material performance and ensuring that porous structures meet the functional requirements of filtration, separation and controlled fluid transport.

Typical Applications

- Membrane filtration development (pore size verification)
- Battery separators and fuel cell membranes
- Filter and textile performance evaluation
- Characterisation of porous ceramics and polymer foams

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Pore size distribution	1.0–1.5 h
Mean and maximum pore diameter	0.8–1.2 h
Bubble point pressure	0.5–1.0 h
Flow and permeability characteristics	1.0–1.5 h

Dry Powder Particle Size Analyser

Laser Diffraction Particle Sizing, Dry Dispersion

Instrument: LA-960V2 – Horiba

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The dry powder particle size analyser measures particle size distribution of free-flowing powders using laser diffraction technology. It provides rapid and accurate size distribution data from sub-micron to millimetre ranges, essential for quality control in pharmaceutical, catalyst, battery material and ceramic applications.

Typical Applications

- Pharmaceutical powder characterisation (drug particle size for inhalation and dissolution control)
- Catalyst and nanomaterial analysis (size distribution and classification of powder catalysts)
- Battery electrode material characterisation (active material particle size for electrode design)
- Cement, ceramic and mineral powders

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Particle size distribution (D10, D50, D90)	0.3–0.8 h
Volume- and number-weighted distributions	0.3–0.8 h
Polydispersity index and span	0.5–1.0 h
Method development and parameter optimisation	1.0–2.0 h

Wet Sample Particle Size Analyser

Laser Diffraction Particle Sizing, Liquid Dispersion (0.01–3500 µm)

Instrument: ANALYSETTE 22 – FRITSCH

Technical custodian: Dr. H.C.S. Perera



Overview

The FRITSCH ANALYSETTE 22 with wet dispersion unit measures particle size distribution of samples in liquid suspension using laser diffraction, covering 0.01–3500 µm. It is essential for characterising nanomaterials, electrode slurries, colloidal dispersions and pharmaceutical suspensions with high precision and reproducibility.

Typical Applications

- Battery electrode slurry characterisation (cathode and anode ink particle size distribution)
- Nanomaterial dispersion analysis (quantum dots and nanoparticles in suspension)
- Pharmaceutical and colloidal suspensions (drug particle size in liquid formulations)
- Ceramic and pigment slurries (milling efficiency and particle size optimisation)
- Polymer latex and emulsion characterisation (droplet size and uniformity)

Services and Indicative Durations

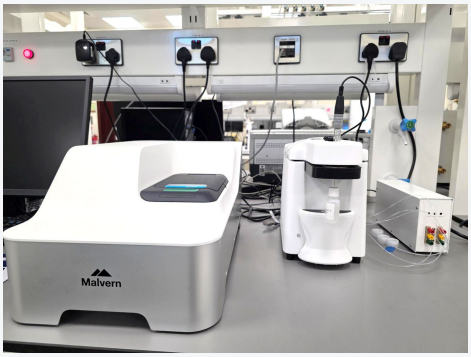
Analysis / result delivered	Indicative instrument duration
Particle size distribution (D10, D50, D90)	0.3–0.8 h
Volume-weighted size distribution and span	0.3–0.8 h
Concentration-dependent particle sizing	0.5–1.5 h
Method development and dispersion optimisation	1.0–2.0 h

Particle Size and Zeta Potential Analyser

Dynamic, Electrophoretic and Static Light Scattering (DLS, ELS, SLS)

Instrument: Malvern Panalytical Zetasizer

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Malvern Panalytical Zetasizer measures particle size, zeta potential and molecular weight of nanoparticles and colloids in liquid dispersions using DLS, ELS and SLS techniques, enabling stability and surface charge analysis.

Typical Applications

- Nanoparticle characterisation (catalyst nanoparticle size distribution)
- Colloidal stability analysis (dispersion stability in solvents)
- Pharmaceutical formulation development (liposome and drug carrier sizing)
- Polymer and protein research (protein aggregation behaviour)
- Energy materials research (nanomaterial stability in electrolytes)
- Water and environmental testing (suspended particle size monitoring)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Particle size (hydrodynamic diameter)	2 h
Zeta potential	2 h
Molecular weight	2 h
Polydispersity index (PDI)	4 h
Diffusion coefficient	4 h

Gas Pycnometer

Helium Pycnometry, True Density Measurement

Instrument: Ultrapyc 7000 – Anton Paar

Technical custodian: Dr. H.C.S. Perera



Overview

The Anton Paar pycnometer precisely measures the true density and volume of solid materials, powders and porous samples using gas displacement (helium pycnometry). It is essential for characterising battery materials, catalysts, ceramics and pharmaceutical powders where accurate density is critical for porosity calculations and quality control.

Typical Applications

- Battery active material density measurement (true density of cathode and anode powders)
- Catalyst and porous material characterisation (true density for porosity calculations)
- Ceramic and composite density determination (sintered pellets and dense compacts)
- Pharmaceutical powder characterisation (true density of drug powders for formulation)
- Quality control in powder processing (density verification for batch consistency)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
True density of solid samples	0.3–0.8 h
True density of powder samples	0.3–0.8 h
Multi-run density averaging and statistics	0.5–1.0 h
Method development for porous materials	1.0–2.0 h

Atomic Force Microscope (AFM)

Nanoscale Surface Characterisation

Instrument: Park Systems FX40

Technical custodian: Dr. H.C.S. Perera



Overview

The AFM provides high-resolution surface topography and property mapping in multiple modes, including non-contact, contact, conductive AFM, PFM and EFM. It measures nanoscale morphology together with electrical and mechanical surface properties.

Typical Applications

- Nanomaterials and thin films
- Semiconductor research
- Polymers and biomaterials
- Surface roughness analysis
- Electrical property mapping

Services and Indicative Durations

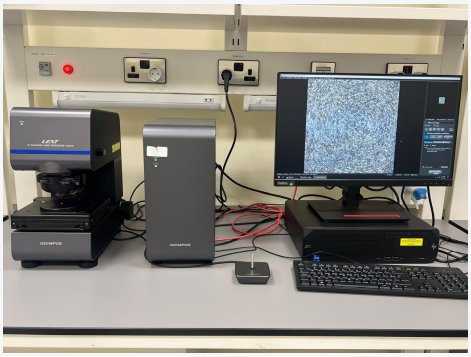
Analysis / result delivered	Indicative instrument duration
Surface topography (nanoscale morphology, roughness)	1–2 h
Non-contact mode imaging	2–4 h
Contact mode imaging	1–2 h
Conductive AFM (C-AFM) current mapping, PFM, KPFM	2–3 h

3D Laser Surface Profilometer

Non-Contact Laser Scanning Confocal Profilometry

Instrument: Olympus LEXT OLS5000

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The laser profilometer provides high-resolution 2D and 3D surface topography analysis using non-contact laser scanning. It is essential for microfabrication, coatings, semiconductors, surface roughness assessment and precision engineering.

Typical Applications

- Surface roughness characterisation for coatings and thin films
- Microfabrication and semiconductor metrology
- Wear analysis in mechanical components
- Surface texture verification in additive manufacturing

Services and Indicative Durations

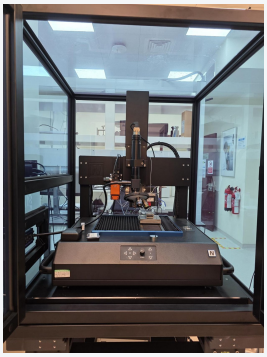
Analysis / result delivered	Indicative instrument duration
3D surface topography	0.5–1.0 h
Surface roughness parameters (Ra, Rz and related)	0.5–1.0 h
Step height and film thickness	0.5–1.0 h
Scratch depth and texture features	0.5–1.0 h

Nanoindenter and Mechanical Tester

Nanomechanical Testing with Integrated AFM Module

Instrument: PB1000 – Nanovea

Technical custodian: Dr. H.C.S. Perera



Overview

The Nanovea PB1000 is a modular nanomechanical testing platform with an integrated AFM module for combined nanomechanical and surface morphology characterisation. It measures hardness, elastic modulus, creep and wear at the nanoscale, and provides surface topography imaging via AFM scanning for thin films, coatings and 2D materials.

Typical Applications

- Thin film hardness and elastic modulus measurement (mechanical properties of coatings)
- Surface topography imaging by AFM (2D materials, nanostructured surfaces)
- Scratch resistance and adhesion testing (coating adhesion and scratch depth profiling)
- Polymer and biomaterial nanomechanical characterisation (viscoelastic nanoscale properties)
- Battery electrode surface analysis (SEI layer mechanical properties and morphology)

Services and Indicative Durations

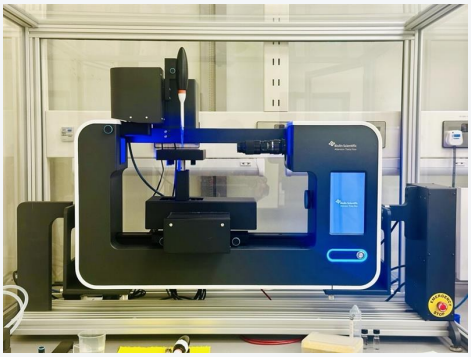
Analysis / result delivered	Indicative instrument duration
Nanoindentation hardness and elastic modulus	0.5–1.5 h
AFM surface topography imaging	0.5–1.5 h
Scratch test and adhesion measurement	0.5–1.5 h
Wear testing and tribological analysis	1.0–3.0 h

Optical Tensiometer, Contact Angle and Interfacial Rheology

Surface Wettability, Contact Angle and Interfacial Rheology

Instrument: Biolin Scientific ThetaFlow

Technical custodian: Dr. H.C.S. Perera



Overview

The optical tensiometer measures static and dynamic contact angles, surface free energy of solids, wettability, surface and interfacial tension, and dilatational interfacial rheology using automated liquid dispensing and imaging. Thermostatted measuring chambers allow measurements from room temperature to 250 °C.

Typical Applications

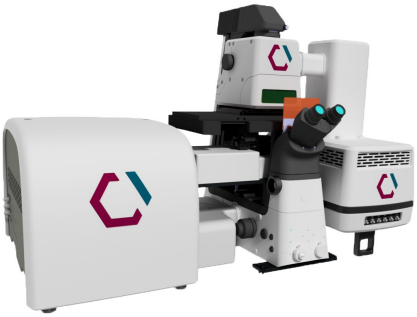
- Coating processes
- Surface treatments
- Material compatibility
- Cleaning and contamination control

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Contact angle measurement (static and dynamic)	1–2 h
Pendant drop method for surface and interfacial tension	2–3 h
Meniscus method for capillary and wetting studies	2–4 h
Topography-assisted wetting analysis (surface heterogeneity effects)	2–4 h
Thermostatted measurements, room temperature to 250 °C	2–4 h

Coherent Raman Spectroscopy, CORAL

COMING SOON



Label-Free Multimodal Chemical Imaging (SRS, TPEF, SHG)

Instrument: CORAL – Chemometric Imaging
Technical custodian: Dr. H.C.S. Perera

Overview

CORAL enables label-free multimodal chemical imaging of cells, tissues, biomaterials and polymers. It measures CH-stretch Raman signals and combines SRS, TPEF and SHG to produce protein and lipid maps, collagen-related tissue contrast, live-cell time-lapse images, Z-stacks and tissue mosaics.

Typical Applications

- Label-free live-cell imaging (lipid and protein distribution in cells)
- Tissue imaging and pathology research (mapping proteins, lipids, collagen and elastin)
- Drug-response studies (monitoring biochemical changes in cells over time)
- Biomaterials and polymer analysis (distinguishing materials such as PS and PMMA microspheres)
- 3D and time-lapse biological imaging (Z-stack and live acquisition modes)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Live-cell biochemical imaging (label-free cellular chemical maps)	0.5–2 h
Tissue chemical mapping (protein, lipid, collagen and elastin contrast)	2–6 h
Drug-response and time-lapse studies (time-series images of cellular response)	2–12 h
3D Z-stack imaging (depth-resolved biochemical image stacks)	2–6 h

Raman and Photoluminescence Spectroscopy and Mapping

Confocal Raman and PL Spectroscopy with 2D Mapping (532 nm and 785 nm)



Instrument: Renishaw inVia Qontor Confocal Raman Microscope

Technical custodian: Dr. Paulraj Gnanasekar

Overview

The Raman spectrometer enables Raman spectroscopy and photoluminescence (PL) spectroscopy, with spatially resolved 2D mapping capabilities. Measurements are performed using 532 nm and 785 nm laser excitations, integrated with a confocal optical microscope and a high-precision automated XY stage for nanoscale spatial analysis.

Typical Applications

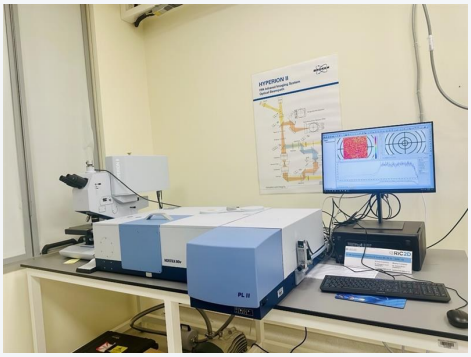
- 2D material identification (graphene, MoS_2, WS_2, hBN)
- Layer number determination in 2D materials (monolayer vs few-layer analysis)
- Defect, strain and doping analysis (peak shifts, intensity ratios, linewidth variations)
- Bandgap and optical property evaluation (via PL peak position and intensity)
- 2D surface Raman mapping (spatial distribution of phases, defects or strain)
- 2D surface PL mapping (emission uniformity, recombination behaviour)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Raman spectroscopy (material identification and vibrational analysis)	1 h
Photoluminescence (PL) spectroscopy (optical and bandgap analysis)	1 h
Raman mapping (spatially resolved Raman analysis)	10–20 h
PL mapping (spatially resolved optical emission analysis)	10 h

FTIR Microscope with Photoluminescence Module

FTIR Spectroscopy, Chemical Imaging and Photoluminescence



Instrument: Bruker Hyperion II FTIR Microscope with PL Module

Technical custodian: Dr. H.C.S. Perera

Overview

This system integrates FTIR spectroscopy, microscopy and photoluminescence (PL) capabilities for advanced chemical and optical characterisation at the micro-scale. It allows users to collect IR spectra from very small areas and to perform chemical imaging and mapping of heterogeneous samples.

Typical Applications

- Polymer identification
- Coating analysis
- Failure analysis
- Chemical mapping
- Pharmaceutical research

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
FTIR spectroscopy (NIR, MIR and FIR), ATR mode	1–2 h
Photoluminescence (PL) spectroscopy at 532 nm	2–3 h
Micro-FTIR point analysis	1–2 h
Chemical mapping and FTIR imaging	2–4 h

Multi-Purpose FTIR Spectrometer

FTIR Spectroscopy (ATR, Transmission, Reflectance, Microscopy)

Instrument: Nicolet iS50 – Thermo Fisher Scientific

Technical custodian: Dr. H.C.S. Perera



Overview

The Nicolet iS50 is a research-grade FTIR spectrometer supporting ATR, transmission, reflectance and microscopy sampling modes. It provides molecular fingerprint identification, functional group analysis and quantitative measurements across the mid-IR and far-IR ranges for polymers, thin films, battery materials and nanomaterials.

Typical Applications

- Polymer and organic material identification (functional group analysis and contamination detection)
- Thin film and surface coating analysis (ATR-FTIR of membranes and coatings)
- Battery electrolyte and SEI layer characterisation (reaction product identification)
- Pharmaceutical and biomaterial analysis (protein secondary structure, drug characterisation)
- 2D materials and nanomaterials (graphene oxide and MXene functional group analysis)

Services and Indicative Durations

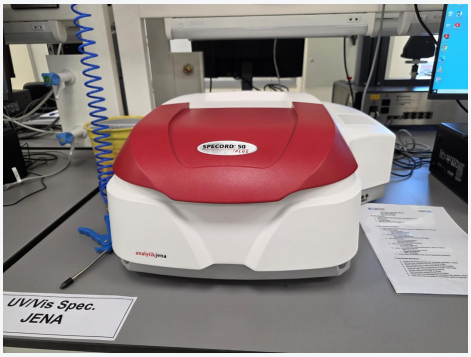
Analysis / result delivered	Indicative instrument duration
Transmission FTIR spectrum acquisition	0.2–0.5 h
ATR-FTIR surface and thin film analysis	0.3–0.8 h
Reflectance and diffuse reflectance measurements	0.5–1.5 h
Quantitative analysis and method development	1.0–3.0 h

UV-Vis Spectrophotometer

UV-Visible Absorption Spectroscopy, 190–1100 nm

Instrument: Analytik Jena

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The UV-Vis spectrophotometer measures absorption and transmission of ultraviolet and visible light (190–1100 nm) through liquid or solid samples. It enables quantitative concentration analysis, optical property characterisation, reaction kinetics monitoring and material purity assessment.

Typical Applications

- Concentration determination of solutions (Beer–Lambert law, protein and enzyme assays)
- Optical properties of thin films and coatings (absorbance, transmittance and bandgap estimation)
- Environmental and water quality analysis (nitrate, heavy metal and dye concentration)
- Reaction kinetics monitoring (photocatalytic degradation rate studies)

Services and Indicative Durations

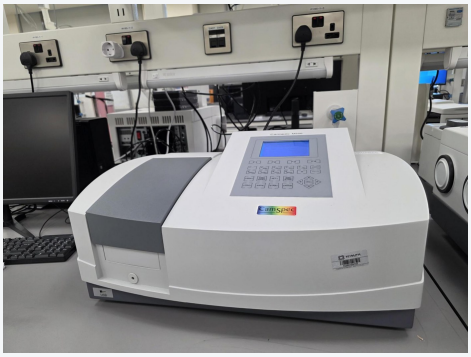
Analysis / result delivered	Indicative instrument duration
Absorbance and transmittance spectra	0.2–0.5 h
Concentration determination (Beer–Lambert)	0.3–0.8 h
Optical bandgap estimation (Tauc plot)	0.5–1.0 h
Kinetic studies (time-resolved absorbance)	0.5–2.0 h

UV-Vis Spectrometer

UV-Visible Absorption Spectroscopy

Instrument: Spectronic M550 – Camspec

Technical custodian: Dr. H.C.S. Perera



Overview

The Camspec Spectronic M550 UV-Vis spectrophotometer measures absorbance and transmittance across the UV-visible spectral range. It enables concentration determination, optical property characterisation, bandgap estimation and kinetics monitoring in solutions, colloidal dispersions and thin film samples.

Typical Applications

- Concentration determination of solutions (Beer–Lambert law, dye and analyte quantification)
- Optical properties of colloidal nanoparticles (plasmonic absorption of Au and Ag nanoparticles)
- Photocatalytic activity monitoring (degradation kinetics of organic dye solutions)
- Semiconductor bandgap estimation (Tauc plot analysis of thin film materials)
- Biological sample analysis (protein concentration and cell culture media characterisation)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Absorbance and transmittance spectra	0.2–0.5 h
Concentration determination (Beer–Lambert)	0.3–0.8 h
Optical bandgap estimation (Tauc plot)	0.5–1.0 h
Kinetic studies (time-resolved absorbance)	0.5–2.0 h

Atomic Absorption Spectrometer (AAS)

Flame and Graphite Furnace Atomic Absorption Spectroscopy



Instrument: Thermo Fisher Scientific iCE 3000

Technical custodian: Dr. Ahmed O. Yusuf

Overview

Atomic Absorption Spectroscopy determines the concentration of specific metal elements in liquid samples by measuring light absorption at element-specific wavelengths. It provides ppb to ppm detection limits for trace metal analysis in environmental, pharmaceutical, food, geological and industrial applications.

Typical Applications

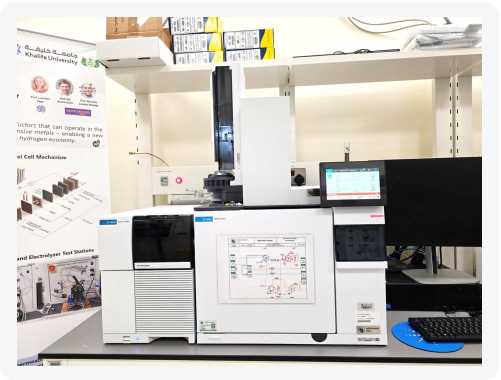
- Environmental water and wastewater analysis (lead, cadmium, copper and chromium quantification)
- Food and agricultural analysis (mineral content determination and heavy metal contamination)
- Geological and ore sample characterisation (trace elements following microwave digestion)
- Industrial quality control (metal content verification in coatings, lubricants and alloys)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Trace metal concentration (single element)	0.5–1.0 h
Multi-element sequential analysis	1.0–2.5 h
Calibration curve development	0.5–1.5 h
Graphite furnace AAS (sub-ppb detection)	1.0–2.0 h

Gas Chromatography – Mass Spectrometry (GC-MS)

Compound Separation, Identification and Quantification



Instrument: Agilent 8890 with MS

Technical custodian: Dr. Paulraj Gnanasekar

Overview

The Agilent GC-MS system provides high-sensitivity compound separation, identification and quantification by coupling a gas chromatograph with a mass spectrometer, enabling analysis of volatile and semi-volatile organic compounds in complex mixtures across research and industrial fields.

Typical Applications

- Reaction product analysis (organic by-products from catalytic, pyrolysis and combustion reactions)
- Environmental monitoring (detection and quantification of VOCs and pollutants in air, water and soil)
- Fuel analysis (compositional analysis of biofuels, synthetic fuels and combustion products)
- Polymer degradation (thermal decomposition products from polymers and composites)
- Purity and trace analysis (trace organic compounds and impurities in synthesised materials)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Volatile compound identification and quantification	0.5–1 h
Retention time and mass spectral library matching	0.5–1 h
Trace-level detection in complex matrices	1–3 h
Quantitative multi-component analysis	2–4 h

Microwave Digestion System

Pressurised Microwave-Assisted Acid Digestion

Instrument: Multiwave 5000 – Anton Paar

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The microwave digestion system rapidly dissolves solid and semi-solid samples under pressurised, microwave-assisted acid conditions, enabling complete sample preparation for subsequent elemental analysis by AAS or ICP. It is essential for trace metal analysis in environmental, geological, food and industrial materials.

Typical Applications

- Environmental and water analysis (heavy metal extraction from soil, sediment and water matrices)
- Food and agricultural testing (mineral content and contamination analysis)
- Industrial materials preparation (catalyst and alloy digestion for elemental characterisation)
- Geological and mining samples (rock and ore dissolution for trace element analysis)

Services and Indicative Durations

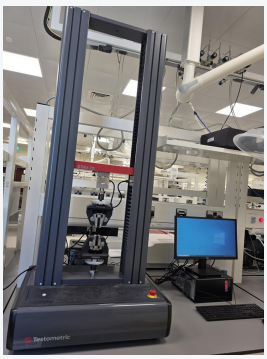
Analysis / result delivered	Indicative instrument duration
Acid digestion of organic and inorganic matrices	0.5–1.5 h
Multi-sample batch digestion	0.5–1.5 h
High-pressure digestion of refractory materials	1.0–2.0 h
Method development for complex matrices	2.0–4.0 h

Universal Mechanical Tester

Tensile, Compression, Flexure and Peel Testing to International Standards

Instrument: X350-20 – Testometric

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The universal mechanical tester performs tensile, compression, flexure and peel tests on materials and components per international standards. It provides stress–strain curves, tensile strength, yield strength, elongation at break, Young's modulus and fracture behaviour for metals, polymers, composites, films and adhesives.

Typical Applications

- Tensile and fracture testing of metals and alloys (yield strength, UTS and elongation at break)
- Polymer film and fibre mechanical characterisation (stress–strain behaviour and failure mode)
- Composite and laminate testing (interlaminar shear strength and flexural modulus)
- Adhesive bond and peel strength testing (lap-shear, 90° and 180° peel qualification)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Tensile strength, yield point and elongation	0.5–1.5 h
Young's modulus determination	0.5–1.5 h
Flexural modulus and strength	0.5–1.5 h
Fracture toughness and peel testing	1.0–2.5 h

Advanced Rheometer with Controlled Environment Testing

Rotational and Oscillatory Rheometry under Controlled Environment



Instrument: DHR 30 – TA Instruments

Technical custodian: Dr. Ahmed O. Yusuf

Overview

The advanced rheometer measures viscoelastic and flow properties of fluids, gels and soft solids under precisely controlled temperature, frequency and environmental conditions. It characterises viscosity, storage modulus, loss modulus and creep behaviour, essential for polymers, hydrogels, inks, slurries and biological materials.

Typical Applications

- Polymer melt and solution rheology (viscosity profiles and shear thinning for processing optimisation)
- Hydrogel and biomaterial characterisation (gelation kinetics and viscoelastic properties)
- Ink and coating formulation development (flow behaviour and thixotropy for printability)
- Battery slurry and electrode paste characterisation (consistency and coating performance)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Viscosity and flow curves	0.5–1.5 h
Oscillatory viscoelasticity (G′, G″)	1.0–2.0 h
Gelation and cure kinetics	1.0–2.0 h
Creep, recovery and stress relaxation	1.5–3.0 h

Thermal Evaporator

Thin Film Deposition by Resistive Thermal Evaporation

Instrument: Moorfield MiniLab 060 Thermal Evaporator

Technical custodian: Dr. H.C.S. Perera



Overview

The system deposits high-purity thin films of metals and other evaporant materials under high vacuum via resistive thermal evaporation, enabling controlled-thickness deposition for research-grade films. Available materials include gold, silver, copper, MoS_2, FeS_2, ZnO, Si (p-type), Ge and ITO (In_2O_3/SnO_2 90/10 wt%).

Typical Applications

- Micro- and nanoelectronics (contacts, electrodes)
- Photovoltaics
- Thin film sensors
- 2D material device fabrication

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Thin film metal deposition (Au, Ag, Al, Cu, Cr and others)	1–2 h
Multilayer thin film stack fabrication	2–4 h
Coating uniformity optimisation	1–2 h

Nano Physical Vapour Deposition (PVD) System

Magnetron Sputtering and Thermal / Electron-Beam Evaporation



Instrument: Moorfield nanoPVD

Technical custodian: Dr. Paulraj Gnanasekar

Overview

The Moorfield nanoPVD is a compact physical vapour deposition system supporting magnetron sputtering and thermal or electron-beam evaporation, enabling deposition of metallic, dielectric and semiconducting thin films with precise thickness and composition control for advanced materials and device research.

Typical Applications

- Thin film electronics (metal contacts and transparent conductive oxides for solar cells and LEDs)
- Functional coatings (anti-reflection, barrier and protective thin film coatings on research substrates)
- 2D material devices (metal electrode deposition on graphene, MoS_2 and other 2D material platforms)
- Photovoltaics (back contact and buffer layer deposition for thin film solar cell fabrication)
- Organic electronics (cathode metal deposition for OLED and organic photovoltaic device fabrication)

Services and Indicative Durations

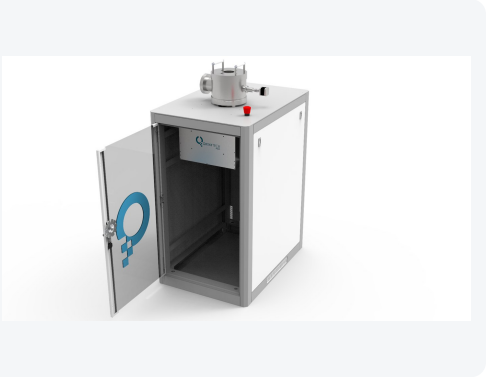
Analysis / result delivered	Indicative instrument duration
Thin film deposition (metals, oxides)	1–3 h
Film thickness and deposition rate	0.5–1 h
Multi-layer thin film stack deposition	2–4 h
Complex heterostructure and alloy deposition	4–8 h

Research-Scale Atomic Layer Deposition (ALD)

Sequential Self-Limiting Surface Reaction Deposition

Instrument: Okyay ALD System

Technical custodian: Dr. H.C.S. Perera



Overview

The Okyay research-scale ALD system deposits ultrathin, conformal films with atomic-level thickness control using sequential self-limiting surface reactions. It is designed for research requiring precise film thickness and composition control over complex substrate geometries, including 2D materials and semiconductor devices.

Typical Applications

- Gate dielectric deposition for transistors (Al_2O_3 and HfO_2 for semiconductor devices)
- Energy storage and conversion coatings (battery electrode and fuel cell component coating)
- 2D materials and heterostructure fabrication (passivation layers for graphene and MoS_2)
- Thin film photovoltaics (buffer layers and surface passivation for solar cells)
- Anti-corrosion and barrier coatings (conformal oxide layers on metal substrates)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Single oxide film deposition (Al_2O_3, TiO_2 and similar)	1.0–4.0 h
Multi-layer stack deposition	2.0–8.0 h
In-situ thickness verification	0.5–1.0 h
Process development and parameter optimisation	4.0–8.0 h

Advanced Powder Atomic Layer Deposition (pALD)

ALD Coating of Particulate and Powder Substrates

Instrument: Beneq Powder ALD

Technical custodian: Dr. H.C.S. Perera



Overview

The Beneq Powder ALD system applies atomic layer deposition to particulate and powder substrates using a fluidised bed or rotary drum reactor. It enables uniform, conformal coating of individual powder particles with sub-nanometre thickness control, essential for surface-functionalising battery materials, catalysts and nanopowders.

Typical Applications

- Battery cathode and anode material coating (Al_2O_3 on $LiCoO_2$ for improved cycle stability)
- Catalyst support surface functionalisation (oxide coating for enhanced catalytic activity)
- Nanopowder encapsulation (moisture barrier coatings on sensitive nanomaterials)
- Fuel cell electrocatalyst modification (surface coating for improved activity and durability)
- Pharmaceutical excipient coating (controlled release and moisture protection of powders)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Single oxide coating on powder substrate	2.0–6.0 h
Multi-layer coating on nanoparticles	4.0–10.0 h
Coating uniformity and thickness verification	1.0–2.0 h
Process development for new powder systems	4.0–8.0 h

Chemical Vapour Deposition System for 2D Materials

Controlled Synthesis of Graphene and 2D Materials

Instrument: planarGROW-4S CVD

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The planarGROW-4S is a thermal CVD system designed for controlled synthesis of high-quality graphene and other 2D materials on metal substrates, offering automated processing, precise gas flow control and reproducible growth conditions for research and pilot-scale applications.

Typical Applications

- Electronics (graphene films for flexible circuits and transparent conductive electrodes)
- Energy storage (graphene in batteries and supercapacitors to improve conductivity and capacity)
- Sensors (gas or biosensors exploiting graphene's high surface sensitivity)
- Coatings (anti-corrosion and protective coatings on metals)
- Research and development (study of 2D materials growth mechanisms and properties)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Layer thickness (mono- and few-layer graphene)	5 h
Structural quality and defects (via Raman spectroscopy)	5 h
Surface morphology, uniformity, electrical conductivity and sheet resistance	10–20 h
Crystallinity and grain size distribution	10 h

Plasma Etching System

Precision Low-Damage Dry Etching and Surface Modification

Instrument: Moorfield nanoETCH

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Moorfield nanoETCH is a compact plasma etching system designed for precise, low-damage material removal and surface modification, offering controlled dry etching processes for nanofabrication, thin film patterning and advanced research applications.

Typical Applications

- Semiconductor fabrication (etching micro- and nano-patterns, pattern transfer on silicon wafers)
- 2D materials research (controlled etching of graphene or MoS_2 layers)
- MEMS and NEMS devices (structuring micro-scale sensors and actuators)
- Optoelectronics (fabrication of photonic and LED structures)
- Surface engineering (cleaning and surface activation for improved adhesion)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Etch rate and material removal uniformity	2 h
Surface roughness and morphology changes	2 h
Selectivity between different materials	4 h

Plasma Surface Treatment System

Low-Pressure Plasma Cleaning, Activation and Functionalisation

Instrument: Diener Plasma Treatment System

Technical custodian: Dr. H.C.S. Perera



Overview

The Diener plasma surface treatment system uses low-pressure plasma to clean, activate or functionalise material surfaces at the nanoscale without wet chemistry. It enables surface hydrophilisation, contamination removal and chemical functionalisation to improve adhesion, wettability and bonding in semiconductor, polymer and biomedical applications.

Typical Applications

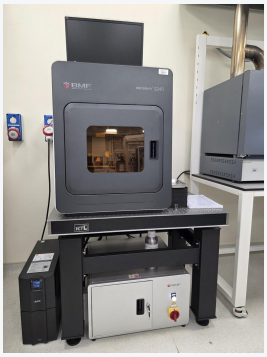
- Surface activation for improved adhesion (polymer bonding and thin film deposition adhesion)
- Substrate cleaning and contamination removal (organic residue removal from silicon wafers)
- Hydrophilisation of polymer surfaces (PDMS and PTFE wettability enhancement)
- Surface functionalisation for biomedical devices (cell adhesion and protein binding)
- Pre-treatment for thin film deposition (ALD, PVD and oxide growth substrate preparation)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Surface activation and hydrophilisation	0.1–0.5 h
Organic contamination removal	0.1–0.3 h
Surface functionalisation treatment	0.2–1.0 h
Process development for new substrates	0.5–2.0 h

High-Precision Micro-Scale 3D Printer

Projection Micro Stereolithography (PμSL), 2 μm Feature Resolution



Instrument: BMF microArch S240

Technical custodian: Dr. Paulraj Gnanasekar

Overview

The BMF microArch S240 is a high-resolution micro-scale 3D printer based on Projection Micro Stereolithography (PμSL) technology, capable of achieving feature sizes down to 2 μm with exceptional dimensional accuracy, enabling precision fabrication of micro-components for research and industrial applications.

Typical Applications

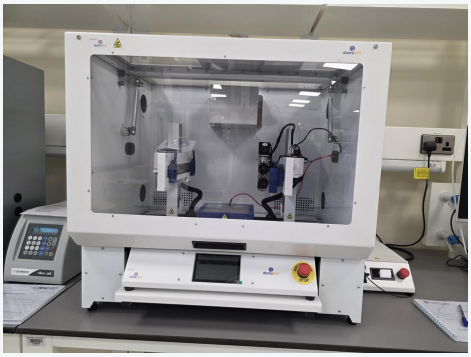
- Microfluidics (fabrication of microchannels and lab-on-chip devices for bioanalytical applications)
- Medical devices (precision micro-components for implants, surgical tools and diagnostic devices)
- Optical components (micro-lenses, waveguides and complex optical microstructures)
- MEMS prototyping (rapid prototyping of micro-electromechanical system structures)
- Research tooling (custom micro-fixtures, holders and experimental components)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Feature resolution and dimensional accuracy	2–6 h
Surface roughness characterisation	1–3 h
Multi-material microscale structures	4–8 h
Complex 3D micro-architecture fabrication	6–12 h

Integrated Melt Extruder, Electrowriter and Electrospinner

Melt Extrusion, Melt Electrowriting and Electrospinning Platform



Instrument: Domobio 4A

Technical custodian: Dr. Paulraj Gnanasekar

Overview

The Domobio 4A is an integrated additive manufacturing platform combining melt extrusion, electrowriting and electrospinning in a single system, enabling fabrication of multi-scale fibrous scaffolds and structures for biomedical, filtration and advanced materials engineering applications.

Typical Applications

- Tissue engineering (hierarchical scaffolds for bone, cartilage and skin tissue regeneration)
- Drug delivery (fibrous drug-loaded membranes and capsules with tunable release profiles)
- Wound healing (electrospun nanofibrous dressings with antimicrobial and bioactive properties)
- Filtration membranes (nanofibre-based filtration media for air and liquid separation)
- Composite reinforcement (aligned fibre preforms for lightweight structural composites)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Fibre diameter and morphology	2–4 h
Scaffold porosity and pore size distribution	3–6 h
Mechanical properties of fibre mats	4–8 h
Multi-scale scaffold architecture fabrication	8–24 h

Electrohydrodynamic (EHD) Printer

High-Resolution Functional Ink Printing (down to 100 µm and below)



Instrument: Enjet MX-II

Technical custodian: Dr. Faisal Shahzad

Overview

The EHD printer deposits conductive and non-conductive materials on substrates including polymers, ceramics and metals. Typical resolution with metal nozzles is approximately 100 µm, with finer resolution achievable using ceramic or glass nozzles. Printed patterns can be deployed as temperature, bio and gas sensors, EMI shielding structures and supercapacitor electrodes.

Typical Applications

- Graphene and MXene based inks
- Polymeric inks
- Particle-free metal inks
- Printed sensors (temperature, bio, gas), EMI shielding and supercapacitor structures

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
High-resolution micro- and nano-pattern printing (line width, dot size, pattern uniformity and accuracy)	3–4 h
Ink and material compatibility and jetting stability (conductive, dielectric, bio or functional inks; Taylor cone and droplet formation)	3–5 h
Thin film and microelectronic device fabrication (electrodes, sensors, micro-LED bonding material, 3D electrode structures)	4–6 h
Process parameter optimisation (voltage, nozzle–substrate gap, flow rate, stage speed, nozzle type, substrate condition)	3–6 h

16-Channel Electrochemical Workstation

Multi-Channel Potentiostat / Galvanostat with EIS

Instrument: BioLogic VMP-300

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The BioLogic VMP-300 is a high-performance, multi-channel potentiostat equipped with 16 independent channels, enabling simultaneous electrochemical measurements on multiple samples. Each channel operates independently, allowing parallel testing of catalysts, electrodes and electrochemical cells under identical or varying conditions.

Typical Applications

- Redox reaction investigation, including hydrogen evolution (HER), oxygen evolution (OER) and other catalytic reactions
- Electrochemical impedance analysis (EIS): charge transfer resistance and interfacial properties
- Corrosion studies: corrosion rates and protective coatings in different environments
- Battery studies: charge–discharge performance, cycling stability and internal resistance
- Stability analysis: long-term chronoamperometry and chronopotentiometry under operating conditions
- Fuel cell and solar cell testing: electrode and MEA performance, current–voltage behaviour

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Oxidation–reduction reactions	2–4 h
Electrochemical impedance analysis	2–4 h
Battery studies and fuel cell analysis	5–10 h
Stability analysis	10–1000 h
Solar cell testing	1–5 h

Research-Grade Potentiostat

Potentiostat / Galvanostat / ZRA with Integrated EIS

Instrument: Gamry Reference 3000

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Gamry Reference 3000 is a research-grade potentiostat, galvanostat and ZRA providing low-noise, high-bandwidth electrochemical measurements with integrated EIS capability, suitable for a broad range of electrochemical characterisation, corrosion studies, battery testing and electrocatalysis research.

Typical Applications

- Corrosion research (potentiodynamic polarisation and EIS for corrosion rate determination on alloys)
- Battery research (charge–discharge cycling and impedance analysis of Li-ion and other cell chemistries)
- Electrocatalysis (rotating disk electrode studies for ORR, HER and OER activity screening)
- Electrodeposition (controlled plating of thin metal and alloy films with precise potential and current control)
- Biosensor development (voltammetric detection of target analytes in biological and chemical matrices)

Services and Indicative Durations

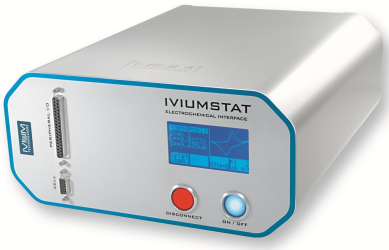
Analysis / result delivered	Indicative instrument duration
Cyclic voltammetry (CV) and linear sweep voltammetry	0.5–1 h
Electrochemical impedance spectroscopy (EIS)	0.5–2 h
Corrosion rate and Tafel analysis	1–3 h
Chronoamperometry and galvanostatic testing	2–6 h

Compact Potentiostat with Frequency Response Analyser

Potentiostat / Galvanostat with Integrated FRA

Instrument: Ivium IviumStat

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Ivium IviumStat is a compact, high-performance potentiostat and galvanostat with integrated frequency response analyser, supporting a broad spectrum of electrochemical techniques for battery testing, fuel cell characterisation, corrosion studies and fundamental electrochemistry research.

Typical Applications

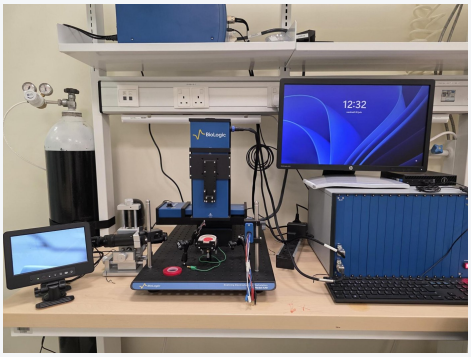
- Battery testing (galvanostatic charge–discharge cycling of Li-ion, Na-ion and solid-state cells)
- Supercapacitor analysis (rate capability and EIS characterisation of carbon-based electrochemical capacitors)
- Corrosion evaluation (polarisation resistance and Tafel slope measurements on metallic samples)
- Electrodeposition studies (controlled metal plating, anodisation and thin film electrodeposition)
- Fundamental electrochemistry (cyclic voltammetry and impedance spectroscopy of redox systems)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Cyclic voltammetry (CV) and linear sweep voltammetry	0.5–1 h
Battery charge–discharge cycling	2–8 h
Electrochemical impedance spectroscopy (EIS)	0.5–2 h
Galvanostatic and potentiostatic protocols	2–6 h

Scanning Electrochemical Microscope (SECM)

Spatially Resolved Electrochemical Mapping at Micrometre Resolution



Instrument: BioLogic M470

Technical custodian: Dr. Paulraj Gnanasekar

Overview

The BioLogic M470 Scanning ElectroChemical Microscope provides spatially resolved electrochemical mapping of surfaces with micrometre resolution, enabling local reactivity, topography and ionic transport measurements for surfaces, interfaces, electrocatalysts and biological systems.

Typical Applications

- Corrosion mapping (spatial imaging of local anodic and cathodic activity on alloy surfaces)
- Electrocatalyst screening (mapping activity distribution on composite and nanostructured catalyst electrodes)
- Biosensor characterisation (local detection of enzymatic activity and biofilm formation at surfaces)
- Battery interfaces (probing SEI formation and local reactivity)
- Surface reactivity imaging (localised electrochemical activity mapping on functionalised electrodes)

Services and Indicative Durations

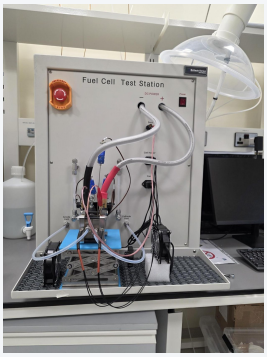
Analysis / result delivered	Indicative instrument duration
Surface current density mapping	1–3 h
Local topography and approach curves	2–4 h
Reactivity and ion flux imaging	3–6 h
Substrate-generation / tip-collection (SG/TC) mode	4–8 h

Electrolyser Testing Station

Water Electrolysis Performance Evaluation

Instrument: Sciencetech

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Sciencetech electrolyser testing station is an integrated system designed to evaluate water electrolysis performance, enabling precise control of operating conditions and real-time monitoring of hydrogen production, efficiency and electrochemical behaviour for energy research applications.

Typical Applications

- Fuel cell and hydrogen research (performance testing of PEM systems, evaluation of new membrane materials)
- Energy systems development (optimisation of hydrogen-based energy systems)
- Catalyst studies (testing electrode catalysts for efficiency and durability)
- Quality testing (validation of commercial stacks)

Services and Indicative Durations

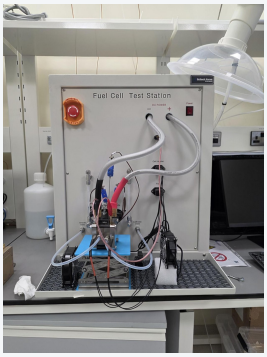
Analysis / result delivered	Indicative instrument duration
Hydrogen production rate and efficiency	1–3 h
Current–voltage (I–V) characteristics	0.5–1 h
Electrochemical performance and overpotential	2–4 h
Faradaic efficiency and electrode stability over time	8–24 h

Fuel Cell Testing Station

Hydrogen Fuel Cell Performance Evaluation under Controlled Conditions

Instrument: Sciencetech

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Sciencetech fuel cell testing station is an integrated system designed to evaluate hydrogen fuel cell performance under controlled conditions, enabling precise measurement of power output, efficiency and electrochemical characteristics across a range of operating parameters including temperature, gas flow, humidity and electrical load.

Typical Applications

- Hydrogen energy research (PEM fuel cell performance testing under varying temperature and humidity)
- Catalyst evaluation (screening electrocatalysts for hydrogen oxidation and oxygen reduction activity)
- Stack development (characterisation of fuel cell stacks for power output and efficiency optimisation)
- Durability studies (long-term stability and degradation testing of membrane electrode assemblies)
- Energy efficiency analysis (comparative testing of fuel cell configurations and operating strategies)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Power density and polarisation curve	1–2 h
Current–voltage (I–V) characteristics	0.5–1 h
Electrochemical impedance spectroscopy (EIS)	1–3 h
Membrane electrode assembly (MEA) performance	3–6 h

Precision Source Measure Unit for I-V Characterisation

Precision Current–Voltage Sourcing and Measurement

Instrument: Keithley 2400 SMU

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Keithley 2400 Source Measure Unit simultaneously sources and measures both voltage and current with high resolution, enabling accurate current–voltage (I-V) characterisation of electronic devices, semiconductor materials, thin films and photovoltaic cells.

Typical Applications

- Semiconductor characterisation (I-V and C-V measurements on diodes, transistors and MOSFETs)
- Solar cell testing (J-V curve characterisation and efficiency parameter extraction under illumination)
- Thin film resistance (four-point probe measurements for sheet resistance of conductive films)
- Sensor calibration (precision current and voltage sourcing for characterisation and calibration)
- Organic electronics (electrical characterisation of organic semiconductors, OLEDs and OPV devices)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
I-V characteristic curves	0.5–1 h
Sheet resistance (four-probe method)	0.5–1 h
Leakage current and breakdown voltage	1–2 h
Device parameter extraction (Vth, Ion/Ioff, ideality factor)	2–4 h

Four-Point Probe and Resistivity Meter

Four-Point Contact Sheet Resistance and Resistivity Measurement

Instrument: Keithley / Ivium configuration

Technical custodian: Dr. H.C.S. Perera



Overview

The four-point probe resistivity meter measures electrical sheet resistance and resistivity of thin films, coatings and bulk materials using the four-point contact method, eliminating contact resistance errors. It is essential for characterising conductive thin films, semiconductor wafers, electrode coatings and transparent conductive oxides.

Typical Applications

- Thin film sheet resistance measurement (ITO, graphene and metal oxide coatings)
- Semiconductor wafer resistivity mapping (doping level and uniformity verification)
- Battery electrode coating conductivity (carbon black and active material resistance)
- Transparent conductive oxide characterisation (SnO_2 and ZnO sheet resistance)
- Surface treatment effect evaluation (conductivity change after plasma or chemical treatment)

Services and Indicative Durations

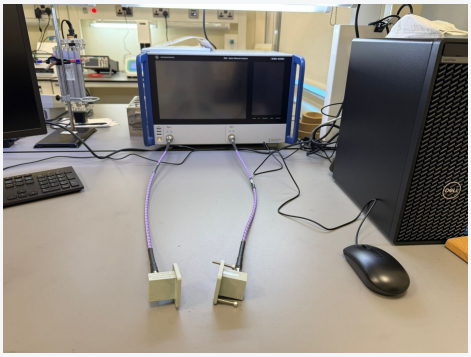
Analysis / result delivered	Indicative instrument duration
Sheet resistance of thin films	0.2–0.5 h
Bulk resistivity of solid samples	0.3–0.8 h
Multi-point mapping and uniformity	0.5–1.5 h
Temperature-dependent resistivity	1.0–3.0 h

Vector Network Analyser (VNA)

EMI Shielding Effectiveness and Dielectric Property Measurement, up to 43 GHz

Instrument: Rohde & Schwarz ZNA43

Technical custodian: Dr. Faisal Shahzad



Overview

The VNA is used to determine electromagnetic shielding properties as well as dielectric properties of materials. Its principal application is measuring shielding effectiveness in the 8.2–40 GHz range, with measurements also possible at lower frequencies (100 MHz–8.2 GHz) using toroidal samples.

Typical Applications

- Electromagnetic interference (EMI) shielding of graphene and MXene based thin films, foams and coatings
- Polymeric materials with nano-filler addition
- 3D printed structures based on conductive fillers

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
S-parameter measurement of RF and microwave devices	2–4 h
Frequency response and bandwidth analysis	2–4 h
Impedance matching and VSWR analysis	3–5 h
Time-domain and fault-location analysis	3–6 h

High-Efficiency Vacuum Oven

Controlled Low-Pressure Drying and Processing, up to 250 °C

Instrument: Memmert VO101

Technical custodian: Dr. Ahmed O. Yusuf



Overview

The high-efficiency vacuum oven provides controlled low-pressure drying and processing of sensitive materials at temperatures up to 250 °C. Vacuum conditions prevent oxidation, enable low-temperature drying of heat-sensitive materials and ensure thorough solvent removal, essential for sample preparation and materials processing.

Typical Applications

- Polymer solution and gel drying (moisture-free drying of hydrogels, aerogels and thin films)
- Battery electrode and separator preparation (low-temperature vacuum drying to prevent degradation)
- Sample preparation for analytical testing (degassing and dehydration before thermal analysis)
- Composite and resin processing (solvent removal and controlled curing under vacuum)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Vacuum drying of powder and film samples	2.0–12.0 h
Solvent evaporation from solutions and gels	2.0–8.0 h
Low-temperature curing under vacuum	2.0–6.0 h
Temperature uniformity and stability assessment	1.0–2.0 h

Glove Box Facility

Inert-Atmosphere Handling with Controlled O_2 and H_2O Levels



Instrument: Vigor 4-Hand Ar Glove Box and 2-Hand N2 Glove Box

Technical custodian: Dr. H.C.S. Perera

Overview

The glove box facility provides an inert atmosphere (argon and nitrogen) with controlled oxygen and moisture levels for handling moisture- and oxygen-sensitive materials, preventing oxidation and degradation of sensitive materials and ensuring experimental reliability.

Typical Applications

- Battery materials
- 2D materials synthesis
- Organometallic chemistry
- Perovskite research
- Air-sensitive device fabrication

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Short task (material transfer, weighing, assembly)	0.5–1 h
Standard experimental work (material preparation, cell assembly, synthesis steps)	2–4 h
Extended research session (multi-step synthesis, batch processing)	4–8 h
Glove box regeneration	24 h

Split Tube Furnace, 1000 °C

Controlled-Atmosphere High-Temperature Thermal Processing (Ar or N_2)

Instrument: Carbolite Gero Split Tube Furnace

Technical custodian: Dr. Paulraj Gnanasekar and Dr. H.C.S. Perera



Overview

The Carbolite Gero 1000 °C split tube furnace is a high-temperature laboratory system designed for controlled heating of materials within a work tube, enabling precise thermal processing, internal atmosphere control (argon or nitrogen) and reproducible experimental conditions for research and material development.

Typical Applications

- Materials research (heat treatment of metals or ceramics, e.g. annealing of metal samples)
- Nanomaterials processing (thermal synthesis, e.g. graphene or CNT growth in controlled atmospheres)
- Chemical processing (reactions under inert or reactive gases, e.g. catalyst preparation under Ar or N_2)
- Semiconductor research (oxidation or diffusion studies of thin films)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Temperature-dependent material behaviour	2–4 h
Thermal stability and decomposition characteristics	3–6 h
Reaction kinetics at high temperatures	4–8 h
Phase transformations and crystallinity changes	6–12 h
Gas–solid interaction effects under controlled atmosphere	6–12 h

Argon Single-Zone Split Tube Furnace, 1200 °C

High-Temperature Processing under Argon and Controlled Atmospheres



Instrument: Carbolite

Technical custodian: Dr. H.C.S. Perera

Overview

The Carbolite single-zone split tube furnace provides precise high-temperature processing under argon or other controlled atmospheres up to 1200 °C. The split-tube design enables easy sample loading and rapid setup for annealing, sintering, pyrolysis and thermal synthesis of battery materials, 2D materials and functional ceramics.

Typical Applications

- Battery material synthesis and annealing (cathode calcination under inert atmosphere)
- 2D material and thin film thermal processing (graphene synthesis and MoS_2 annealing)
- Catalyst synthesis and thermal activation (oxide catalyst reduction and activation)
- Pyrolysis and carbonisation of organic precursors (carbon material and biochar synthesis)
- Ceramic and oxide sintering (sintering of electrode and electrolyte pellets)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Annealing under argon atmosphere	1.0–4.0 h
Pyrolysis and carbonisation processing	2.0–8.0 h
Material synthesis at high temperature	2.0–12.0 h
Multi-step thermal processing protocols	4.0–16.0 h

Nitrogen Single-Zone Split Tube Furnace

Inert-Atmosphere High-Temperature Processing under Nitrogen

Instrument: Carbolite

Technical custodian: Dr. Paulraj Gnanasekar



Overview

The Carbolite nitrogen-atmosphere split tube furnace provides a controlled inert gas environment for high-temperature processing of materials, enabling precise thermal treatment without oxidation for research in carbons, ceramics, energy storage materials and catalyst preparation.

Typical Applications

- Carbonisation and pyrolysis (converting polymer precursors to carbon materials under nitrogen)
- Annealing and sintering (heat treatment of metal and ceramic powders in inert atmosphere)
- Catalyst preparation (thermal activation and reduction of catalytic materials under controlled atmosphere)
- Battery materials (synthesis of electrode active materials and solid electrolytes)
- Carbon nanostructures (growth and activation of carbon-based materials for energy storage)

Services and Indicative Durations

Analysis / result delivered	Indicative instrument duration
Temperature-controlled annealing profiles	2–4 h
Pyrolysis and carbonisation yield	3–8 h
Sintering density and phase identification	4–8 h
Atmosphere-controlled phase transformations	6–12 h

Working With Us

01 Enquiry

Contact the RIC2D laboratory management team with a description of your samples, the properties of interest and any applicable standards. Enquiries are processed through Khalifa University Enterprises Company (KUEC) under the applicable agreement.

02 Scoping and quotation

Our specialists confirm technical feasibility and recommend the most suitable techniques. A formal quotation covering scope, durations and deliverables is issued through KUEC as per the applicable agreement.

03 Agreement and scheduling

The engagement is formalised under the applicable KUEC service agreement, and instrument time is scheduled.

04 Execution and reporting

All analyses are performed by RIC2D's PhD-level laboratory specialists, and results are delivered in a documented report.

RiC2D

جامعة خليفة
Khalifa University

Research and Innovation Center for Graphene and 2D Materials (RIC2D)
Khalifa University of Science and Technology
Abu Dhabi, United Arab Emirates

Attention: Dr Sergio Cacciola, RIC2D Labs Manager and Intratomics Lab Manager

Specifications, durations and availability are subject to confirmation at the quotation stage.