

Materials and Characterisation

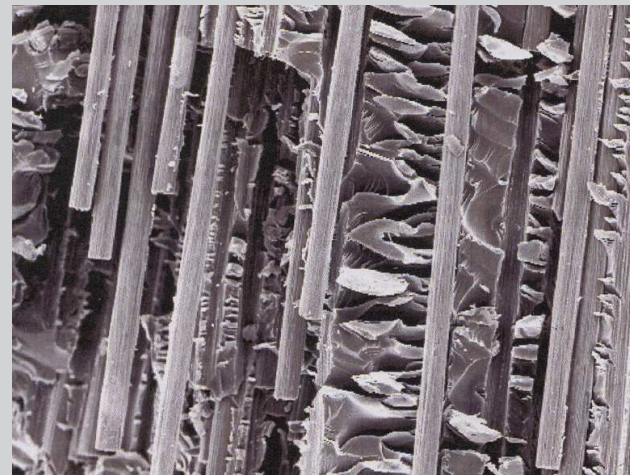
NCCEF offers an extensive range of analysis equipment for the characterisation of composites and their constituent materials.

A state-of-the-art thermal analysis laboratory is equipped with differential scanning calorimetric, thermal mechanical, thermo-gravimetric and rheometric analysis equipment, allowing the investigation of reaction kinetics, degree of cure, glass transition temperature and viscoelastic properties.

Optical, electron and acoustic microscopy facilities are available within NCCEF for observing microstructural details within materials as well as examining fracture surfaces of failed composites.

Capabilities

- Differential Scanning Calorimetry
- Thermal Mechanical Analysis
- Thermo-Gravimetric Analysis
- Rheometric Analysis
- Infrared Spectroscopy
- Anton Paar Multiwave 3000 Microwave Reaction System
- Microscopy – Optical and SEM
- Raman Microscopy



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NCCEF as part of the School of Materials at The University of Manchester has access to a comprehensive range of SEM, TEM, Raman, AFM and Optical Microscopies.

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Differential Scanning Calorimetry										
Manufacturer & Model	DSC Heating Cell	Measurement Principle	Temperature Sensor	Autosampler	Dynamic Range	Temperature Range	Temperature Accuracy	Heating Rates	Cooling Rates	Ballistic Cooling
Perkin Elmer DSC 8500	Double Furnace	Power Compensation	Distributed Platinum resistance thermometers	96 position	±1300 mW	-180°C to 750°C	±0.05°C	0.01-750°C/min	0.01-750°C/min	2100°C/min
Perkin Elmer Jade DSC	Single Furnace	Heat Flux	Chromel alloy disc (90%Nickel/10%Chromium)	45 position	±175 mW	-80°C to 450°C	±0.1°C	0.1-100°C/min	0.1-100°C/min	n/a

Thermal Mechanical Analysis									
Manufacturer & Model	Temperature Range	Scanning Rates: Heating Cooling	Frequency: Range Max Number Resolution	Dynamic Displacement	Stiffness: Range Resolution	Modulus: Range Resolution	Force: Range Minimum Resolution	Displacement/Strain: Range Resolution	Sample Size
Perkin Elmer DMA 8000	-190°C to 400°C	0-20°C/min 0-40°C/min	0-300 Hz 100 0.001 Hz	±1000 mm	2x10 ² to 1x10 ⁸ N/m 2 N/m	~10 ³ to 10 ¹⁶ Pa 0.0001 Pa	±10 N 0.002 N 0.002 N	±1000 mm 1 nm	52.5 x 12.8 x 8.0 mm

Thermo-Gravimetric Analysis										
Manufacturer & Model	Balance Type	Balance Capacity	Balance Sensitivity	Balance Accuracy	Balance Precision	Temperature Range	Scanning Rates	Temperature Accuracy	Sample Temperature Precision	Cooling Time
Perkin Elmer TGA 4000	Top-loading	1500 mg	1 mg	±0.02%	±0.01%	Ambient to 1000°C	0.1-200°C/min	±1°C	±0.3°C at 300°C ±0.5°C at 900°C	1000°C to 100°C < 8 minutes 1000°C to 30°C < 15 minutes

Rheometry										
Manufacturer & Model	Temperature Range	Minimum Torque Rotation	Minimum Torque Oscillation	Maximum Torque	Torque Resolution	Minimum Oscillation Frequency	Maximum Oscillation Frequency	Minimum Normal Force	Maximum Normal Force	Normal Force Resolution
Thermo Scientific Haake Mars III Rheometer	-150°C to 600°C	0.01 mNm	0.003 mNm	200 mNm	0.1 nNm	10 ⁻⁶ Hz	100 Hz	0.01 N	50 N	0.001 N