

Polymer Characterisation Laboratory

Techniques Available

Differential Scanning Calorimetry	DSC	TG-MS and TG-IR	EGA
Thermogravimetric Analysis	TGA	Infra Red Spectroscopy	FT-IR
Dynamic Mechanical Analysis	DMA	Thermal Conductivity	HotDisk
Rheology	SR-200	Elemental Analysis	ICP-AES

Contact Details

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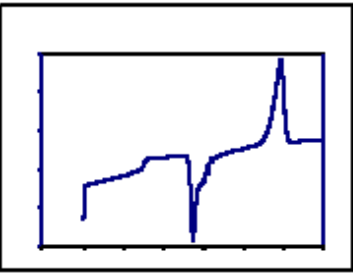
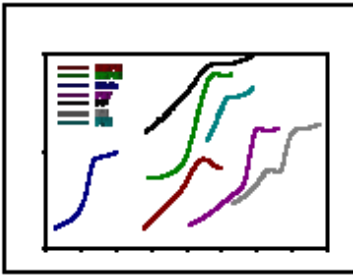
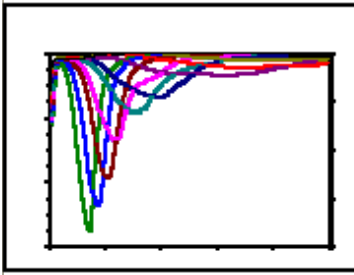
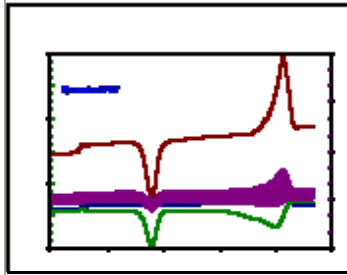
The laboratory facilities are available for use by members of the Materials Science Department, other University departments and for external consultancy.

Differential Scanning Calorimetry (DSC)

TA Instruments Q2000

DSC is a very sensitive technique with many applications. By measuring the *heat flow* between a sample and an inert reference, thermal properties can be measured as a function of temperature or time. Samples can be heated at a constant rate, held isothermally or quenched cooled.

Applications

			
Polymer Properties	Glass Transition	Crystallisation Kinetics	Modulated DSC
Melting	Solid State Transitions	Heat Capacity	Shape Memory Effects
Oxidation	Combustion	Thermal History	Manufacturing Processes

Features

- *Range:* -150°C (with liquid nitrogen cooling) to 1500°C
- *Sample Size:* <5mg needed
- *Heating Rate:* 0.1 to 100°C/min
- *Quench Cooling:* -100°C/min
- Simultaneous DSC-TGA ([SDT](#))

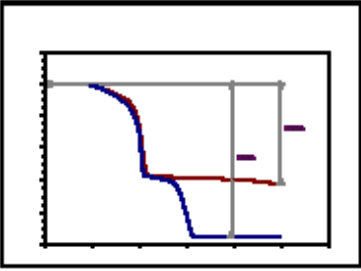
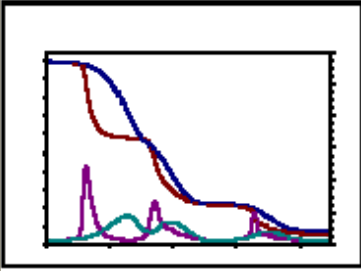
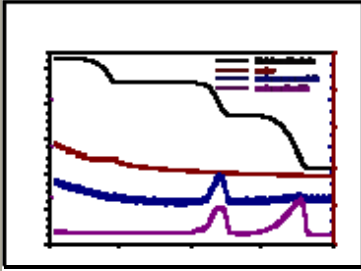
In **Modulated DSC** a sinusoidal heating rate is applied to a sample. This provides a powerful tool for the resolution of complex or overlapping thermal events.

Thermogravimetric Analysis (TGA)

TA Instruments Q500

Sample weight is measured as a function of temperature or time.

Applications

		
Compositional Analysis	High Resolution TGA	Evolved Gas Analysis
Decomposition	Combustion	Water Content

Features

- *Maximum Temperature:* 1500°C
- *Sample Size:* Losses of a few wt% can be detected with as little as 1mg of material.
- *Heating Rate:* 0.1 to 200°C/min
- *Automatic Gas Switching:* Nitrogen, Oxygen, Argon or Helium
- Simultaneous DSC-TGA ([SDT](#))

In **High Resolution TGA** a dynamically controlled heating rate is used to increase resolution.

Evolved Gas Analysis (EGA)

Nicolet IS 10 Infra Red Spectrometer

Pfeiffer Vacuum ThermoStar Mass Spectrometer

The products of a reaction can be identified by combining TGA with infra-red spectroscopy (TG-IR) or mass spectrometry (TG-MS).

Simultaneous DSC-TGA (SDT)

TA Instruments Q600

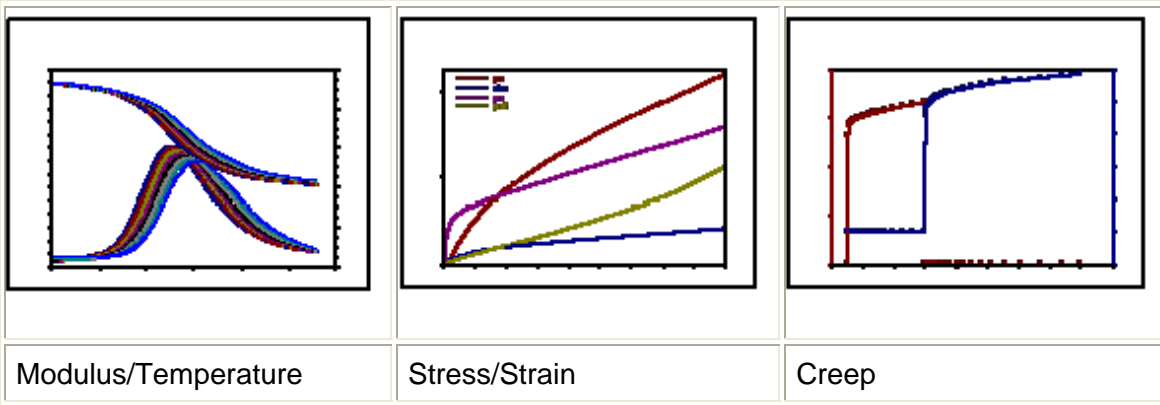
DSC and TGA are combined in a high temperature (up to 1500°C) instrument.

Dynamic Mechanical Analysis (DMA)

TA Instruments Q800

The viscoelastic properties of the material are investigated by the application of sinusoidal stress. The technique can be adapted for almost any type of sample including gels and powders.

Applications



Features

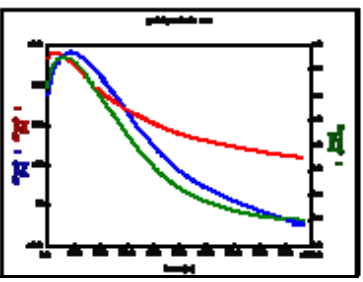
- *Temperature Range:* -150 to 600°C
- *Frequency:* 0.01 to 200 Hz
- *Force:* 0.1 mN to 18 N
- *Modulus:* 1000 Pa to 3000 GPa
- *Modes:* cantilever, tensile, 3-pt bend, shear, compression, submersion

Rheometry

Rheometrics SR-200

A versatile technique used to study the viscoelastic properties of fluid materials.

Applications

	Gels
Viscosity	Suspensions
Loss/Storage	Adhesives
Creep/Recovery	Foodstuffs

Infrared Spectroscopy

Bruker Tensor 27 Infrared Spectrometer

A "fingerprint" technique for organic materials.

Thermal Conductivity

HotDisk Thermal Constants Analyser

ICP-AES

Varian Liberty ICP

Elemental analysis of aqueous solutions by atomic emission spectroscopy. Most elements to <1ppm.

Links

- [Department of Materials Science](#)
- [University of Cambridge](#)
- [TA Instruments: Applications Library](#)