



# THERMAL ANALYSIS OF MATERIALS

Scion offers specialised equipment and capability to characterise the chemical and physical properties of materials over a range of temperature and time.

Scion works with manufacturers and product developers to characterise the properties of materials as they change with temperature using a range of thermal analysis technologies.

We have the capability to characterise polymer materials and support product development based on plastics, polymers, composites, adhesives, coatings, lignocellulosic (woody) material, plant fibres, green chemicals and organic wastes.

Our unique combination of advanced equipment and capability provides manufacturers with the R&D support they need on one site, with services tailored to suit individual client needs.

## DYNAMIC MECHANICAL THERMAL ANALYSIS (DMTA)

Scion's DMTA is the most advanced platform available in New Zealand for dynamic mechanical analysis of the viscoelastic properties of materials from -150°C to 600°C, in both air or liquid. These precise measurements of material properties allow manufacturers to test newly developed materials, including biomaterials,

and to comply with industry standards for materials performance.

The DMTA can perform many tests, including: creep and recovery, stress relaxation, stress ramps, strain rate ramps, iso-strain, iso-force, fatigue, multi-wave, and Dielectric Thermal Analysis (DETA). This apparatus measures: modulus of elasticity, shear modulus, complex moduli, storage and loss moduli, damping properties, frequency effects, creep and recovery, stress relaxation, glass transition temperature, secondary transitions and crystallisation and heat deflection temperature.

## RHEOMETRY

Used for both quality control and in R&D applications, this measures the rheology or flow properties of materials, evaluates thermal degradation during processing, provides data for simulation of extrusion and helps determine which material best fits a process or application.

Scion's rheometer can characterise the viscoelastic properties of polymer melts and other viscous liquids for a range of shear stress, rates, and temperatures. The rheometer is equipped with an environmental test chamber enabling testing over a range of temperatures. Stability of viscosity can be assessed for polymers at constant temperature and gelation can be monitored in resins.



## DIFFERENTIAL SCANNING CALORIMETRY (DSC)

Scion tests the thermal properties of materials and products for processors and end-users of polymers, plastics, resins, adhesives and paints.

Our state-of-the-art Discovery DSC is a powerful tool that measures heat capacity of a material over a wide temperature range. It can be used to determine phase transitions such as melting point ( $T_m$ ), glass transition temperature ( $T_g$ ), energy absorbed ( $H_m$ ) while melting, crystallisation point ( $T_c$ ), percent crystallinity, rate of crystallisation, energy released ( $H_c$ ) during crystallisation, cure rate and exo/endothemic reaction parameters. For example, the apparatus can measure the effectiveness of thermal antioxidants in plastics.

The DSC can also be used to measure thermal properties of thermosets, elastomers, composites, fibres, foods and pharmaceuticals. It has an autosampling platform for high-throughput analysis and operating temperatures of  $-90$  to  $400^\circ\text{C}$ . The DSC also measures phase transition of samples under gas pressure, and can be used to assess thermal transitions of wet samples at temperatures above  $100^\circ\text{C}$ .

## THERMOGRAVIMETRIC ANALYSIS (TGA)

TGA assesses the thermal degradation of materials by measuring the amount and rate of change in the weight of a material, as a function of temperature or time in a controlled atmosphere. These measures are used to determine the thermal and oxidative stabilities of materials, and their compositional properties including moisture and ash content.

TGA or modulated TGA can be used to estimate product lifetime, decomposition and drying kinetics, and the

effects of reactive atmospheres on materials. It is especially useful for the study of thermoplastics, thermosets, elastomers, composites, films, fibres, coatings and paints.

## MELT FLOW INDEX (MFI)

Our MFI accurately measures the Melt Mass-Flow Rate (MFR) and the Melt Volume-Flow Rate (MVR), from which MFI can be derived.

These are basic data required for thermoplastics quality control, measuring the comparative ease of flow of a particular polymer and verifying that the plastic's grade is within the required fluidity range. The MFI is used in R&D of new materials, for example, in our biofibre programme to investigate the melt flow of wood fibre-reinforced thermoplastic composites.

## WORKING TOGETHER

Scion can tailor contractual arrangements to meet the specific needs of each customer. These could include:

- Service provision, where we undertake specific projects for clients, involving specialised testing and problem solving.
- One-on-one confidential research projects targeted to maintain client competitiveness.
- Joint technology development partnerships with joint risk and reward.
- Strategic multi-party alliances to address sector-based challenges and innovation opportunities.

### CONTACT

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