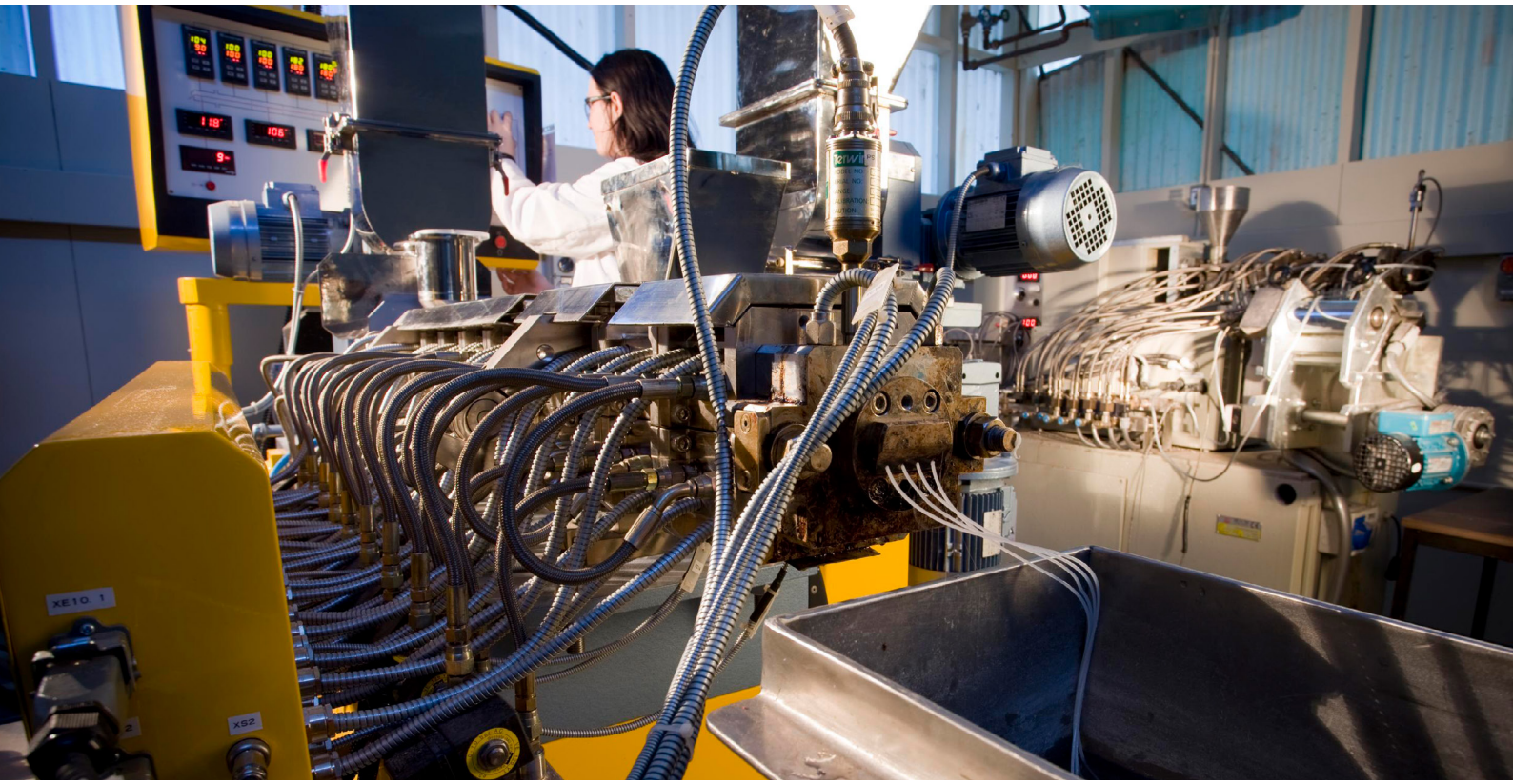
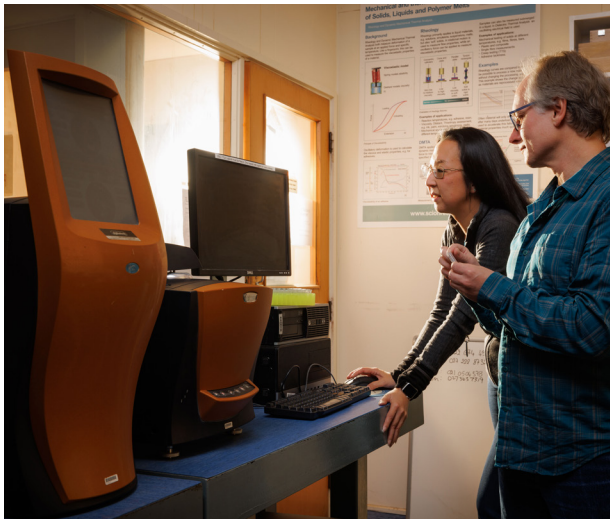


Materials characterisation and processing

Scion's materials characterisation and processing facilities are available to commercial clients. Our expertise covers a wide variety of testing from mechanical performance, analytical chemistry, thermal analyses, microscopy; processing includes polymer processing, additive manufacturing, coatings and biorefining equipment. We cover fibres, composite materials, bioplastics and more.

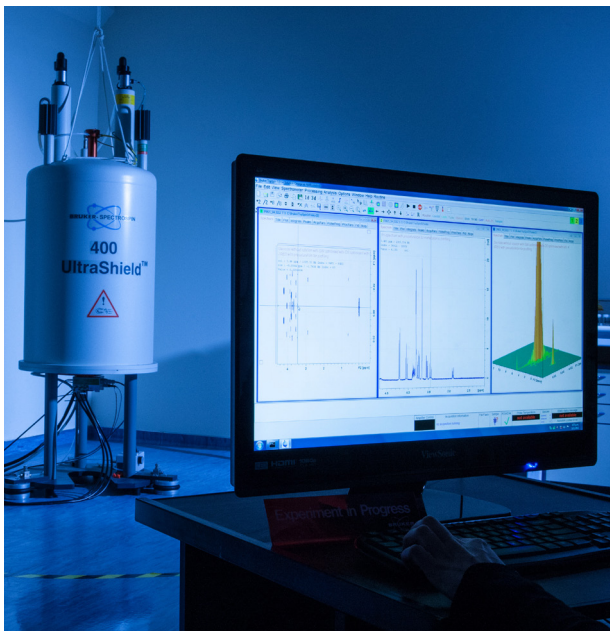


Thermal analysis with Marie-Joo Le Guen and Stefan Hill.

Materials Characterisation

- Universal Test Machines of various sizes and testing attachments (tensile, flexural, compression), some with heat/environmental chambers, including cooling.
- Impact Tester - Izod and Charpy testing capability.
- Dynamic Mechanical Thermal Analyser (DMTA) with submersion testing capability to determine thermal and mechanical properties including HDT (heat distortion temperatures), creep, low and high temperature tests. Integrated Dielectric Thermal Analyses (DETA) used for monitoring cure or setting or solidification or changes in fluidity in resins.
- Differential Scanning Calorimetry (DSC) to measure thermal transitions, heat of reaction and heat capacities (via modulated DSC). Also measures oxidation induction times (antioxidant effectiveness).
- Thermogravimetric Analyses (TGA) to measure weight loss versus temperatures as a measure of thermal stability or off gassing/temperatures of decomposition.
- Rheometer (up to 400°C, variable frequency/shear rate). Provides detailed data on viscosity/rheology of polymers including plastic melts, adhesives and emulsions.
- Light/Laser Flash Analyser (LFA) for measuring thermal diffusivity and thermal conductivity.
- Grecon DAX6000 Materials Density Profiler.
- Field Emission Scanning Electron Microscope (FE-SEM) with TEM capability and nanometer resolution, with EDAX (elemental analysis). Fourier Transform Infra-Red (FTIR) Microscope, Laser Confocal/Fluorescent Microscopes and other types of microscopes (e.g. optical, hot stage with digital photography).
- Gel Permeation Chromatography (GPC) for molecular weight analyses of synthetic and bio-based polymers.
- Camsizer X2 particle sizing equipment to measure to measure particle size and shape of bulk solids, emulsions or suspensions.
- FTA 1000 Contact angle and surface analyser; Cahn balance; Moisture vapour transmission rate testing (MVTR) - measure of water interactions.
- Accelerated weathering testing: QUV & QSun with UV/humidity/temperature cycling.
- Colour measurement.
- Compostability and biodegradation testing facilities including Ecotoxicology testing.

Scion tests adhesives including bioadhesives.



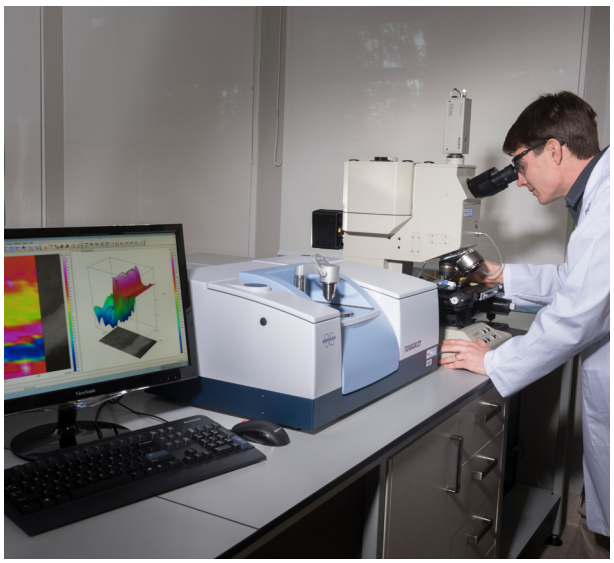
Multinuclear solid state Nuclear Magnetic resonance (NMR).

Chemical Analyses

- Multinuclear solid state Nuclear Magnetic resonance (NMR) incl. 1 H at 500 MHz, Multinuclear solution state NMR at 600 MHz.
- Gas Chromatography – Mass Spectroscopy (GC-MS) (TQ) including headspace/volatiles and olfactory. Pyrolysis GC-MS.
- Liquid Chromatography – Mass Spectroscopy (LC-MS) (TQ and QTOF) for non-target screening and quantification of non-volatile compounds such as plastic additives.
- Fourier Transform Infra-Red (FTIR) spectroscopy with attenuated total reflectance (ATR) for material identification and quantification of simple mixtures.
- Other chemical analysis equipment: Atomic absorption spectroscopy (AA), UV-VIS spectroscopy, High-performance liquid chromatography (HPLC), Gas chromotagraphy (GC), Inductively coupled plasma mass spectrometry ICP-MS, trace element analyses, Near Infra-Red spectrometry (NIR), etc.
- Food contact migration testing.

Materials Processing/Synthesis

- LabTech LTE26-40 Twin Screw Extruder (l/d 40; 26mm screw; co-rotating) with hopper, feeders, strand pelletiser, water bath, multi-strand die, variable screw configurations. Die face (air cooled) pelletiser, sheet and 3D printing filament attachments also available.
- LabTech Single Screw Extruder LBE20-30C (l/d 30; 20mm screw).
- Thermofisher Rheomex 16mm Twin Screw Extruder (l/d 40; 16mm co-rotating screw) with feeders.
- Thermofisher Rheomix Batch mixer with Roller and Bradbury mixing heads.
- Twin-screw extrusion modelling capabilities for process development and troubleshooting.
- Cross head die extrusion: cable coating; long fibre reinforced plastics.



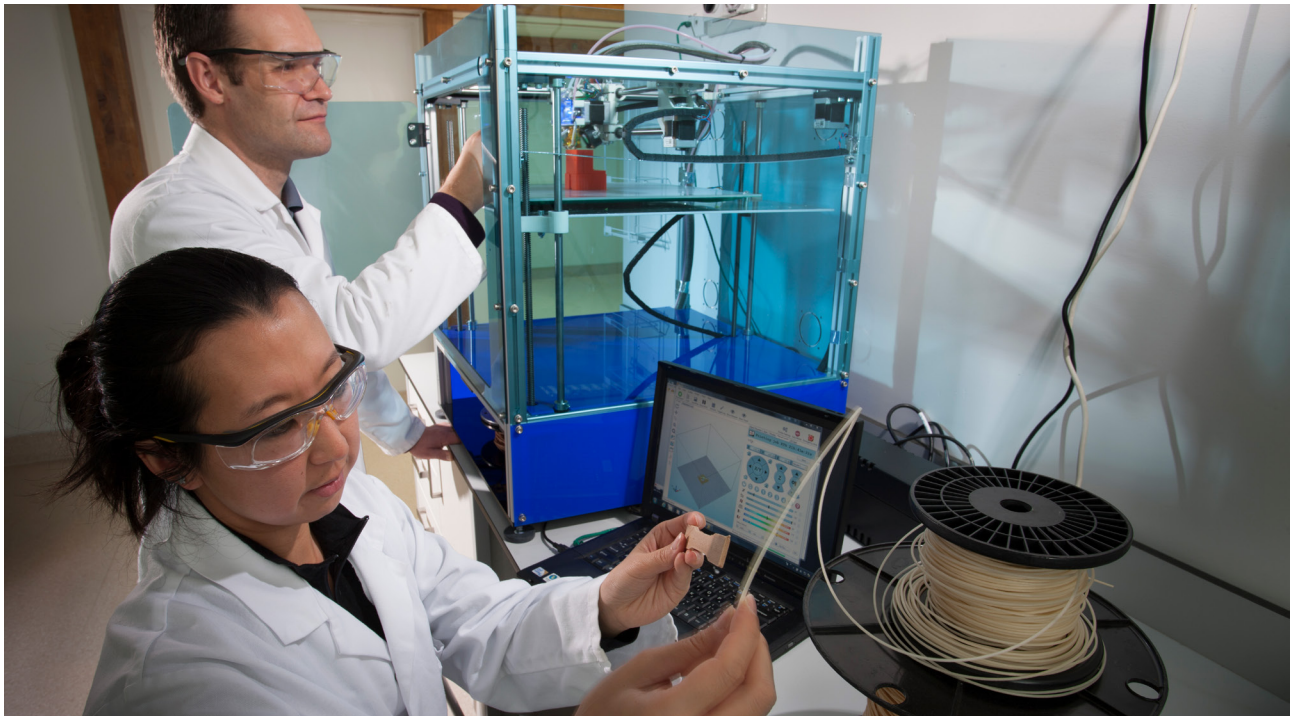
The Fourier Transform Infra-Red Spectroscopy.

A colour-changing and flexible 4D printing filament developed by Scion.

- Batch pre-mixers, 5 and 20 litre.
- Boy 35M injection moulding machine, with various mould tools.
- Pinette Laboratory hot press 800 kN, 600 x 600 mm platens, fully automated.
- Siempelkamp hot press, 600 x 600 mm platens, fully automated.
- Polymer foaming equipment, various types and scales of equipment for various foams (thermoplastic particle foams (CO_2 mediated processing), urethane, phenolic, polyester etc).
- Composite manufacturing, including wood panels (MDF, particleboard, plywood) thermoplastic composites, thermoset fibre reinforced composites.
- Film casting equipment.

Additive Manufacturing

- Voron 2.4 and Creality K1 Max FFF printers for small-volume production/prototyping.
- Black Belt 3D FFF belt printer.
- Makergear M2, dual extruder FFF printer for material trials and dual material printing.
- Markforged mark two, FFF printing with semi-continuous fibre reinforcement.
- Large format FDM pellet printer, parts up to $1m^3$, high solids content, print temperatures up to 500°C.
- Anycubic Photon Mono X 6KS LCD resin printer for small volume production/prototyping.
- 3Devo Filament Maker for custom and recycled filament production.
- Creaform Handyscan Metrology grade 3D scanner.
- Engineering CAD design and 3D modelling.



Scion has additive manufacturing capabilities.

Fibre and Biorefining Processes

- Biomass processing (hammer mill).
- Pre-treatments (fibre treatment) reactor equipment.
- Supercritical Fluids Reactor and Supercritical Fluids (CO_2) Extraction.
- Mechanical Fibre Processing Pilot Plant (pulp manufacture).
- Chemical pulping equipment.
- Continuous fibre impregnation line.
- Fibre-cement manufacturing equipment.

Coating

- IGT F1 laboratory flexo press; IGT AIC2-5 laboratory offset press.
- RK K303 multicoater/printer with Flexo & Gravure printing head.
- RK K202 laboratory control coater.
- Canon iP4500 inkjet printer with dye-based ink system.
- Epson TX 4000 inkjet printer with pigment-based ink system.
- GJS 13040 screen printer with option for custom-made designs and different screen types (mesh material, thread diameter and density).
- Osilla L2002A3-0738 UV ozone surface modification setup.
- QEA camera and software for print quality characterisation.

Scion conducts biodegradation testing.

Contact information

Marc Gaugler
Portfolio Leader, Distributed and Circular Manufacturing
marc.gaugler@scionresearch.com
+64 7 343 5899

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FORESTS ▪ PRODUCTS ▪ INNOVATION

About Scion

Scion is the Crown research institute that specialises in research, science and technology development for forestry, wood and wood-derived materials, and other biomaterial sectors.

Scion's purpose is to create economic value across the entire forestry value chain, and contribute to beneficial environmental and social outcomes for New Zealand.

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