

Characterised by Expertise

Working today with many prestigious clients, Intertek MSG is based at the Wilton Centre in the North East of the UK. Intertek MSG has over 40 scientists, with deep expertise in the characterisation of chemicals, polymers, composite materials, catalysts and other inorganic materials. In recent years the Group has also applied its skills in areas such as pharmaceuticals and medical devices, extending its customer base to these sectors. All facilities operate to UKAS Quality registration standards and several laboratories work to GLP standards, upon request. Our clients are based in many parts of the world and use us for problem-solving and projects, as well as complementing their own measurement facilities with some of the specialised ones we have.

A detailed listing of the technical capabilities of the Group is available, but, speaking more generally, the services that we provide can be broadly categorised as:

Consultancy

Many of MSG's scientists are national or international experts in their fields. We can provide consultancy services ranging from short discussions & advice through to more detailed programmes, including the provision of reports on measurement issues or the supply of expert witness services for product dispute or litigation cases.

Materials Research Projects

MSG also works closely with customers on longer-term projects, often targeted at the development or optimisation of new materials. The MSG materials characterisation, measurement and processing expertise (for example in the area of structure-property relationships) may complement the customer's own synthetic or processing skills. Such projects may be led by either the customer or by MSG personnel.

Problem Solving

In many cases our customers do not have a defined measurement need, but rather have a materials-related problem – for example of product quality, performance or processability. In this case our scientists will consult with the customer and define an appropriate set of measurements in order to investigate the issue. These may often be spread across a number of the Group's teams. Results will be collated and presented to the customer in terms of the solution to the problem posed.

Method Development

MSG scientists have much experience in the development and modification of measurement methodologies, for application to specific customer problems. This has ranged from the adaptation of 'routine' measurements for novel sample types through to major projects on the development of on-line measurement tools or the design of screening protocols for high throughput experimentation.

Provision of data

The wide range of MSG's measurement capability is described in the Appendix. Where the customer has specific requirements falling within this portfolio we can give a responsive data provision and interpretation service, whether for single samples or for ongoing QA type needs. The expertise of our scientists means they can interpret the results obtained in the context of the customers' products or processes. Measurement methodology can be customised if necessary to meet specific customer requirements.

It should be clear from the above, that whilst MSG has skills in a wide range of analytical techniques, our strength derives from the ability to combine an appropriate set of measurements for any given situation. Examples of areas where this combinational approach has been developed to give us specific expertise include:

Deformulation & Reverse Engineering

The ability to “pull apart” a chemical formulation is crucial in many applications – from quality assurance to competitor analysis. This is a core competency of MSG, with the combination of methods such as NMR, Mass Spectrometry and Separation providing a powerful resource, enabling us to determine the components present in complex chemical mixtures or highly formulated materials.

Chemical Imaging

MSG has invested heavily to augment our capabilities in chemical imaging over recent years. In general, the techniques allow us to build up a chemical ‘map’ of a material surface or interior, where each spatial element of the image contains detailed information on chemical composition – for example in the form of a full infrared spectrum associated with each point. These methodologies generate unprecedented quantities of information which can be presented visually, allowing for detailed studies of sample heterogeneity, active ingredient disposition, contamination distribution or any other aspect of material composition. Available methods include Global Infrared Imaging, Raman, SIMS and XPS imaging and confocal microscopy.

Structure-Property Relationships

MSG has the ability to study the structure of materials at all levels – from molecular (using methods such as NMR or Mass Spectrometry), or polymeric (including chain length, molecular weight etc) through to micro- or macro-scale morphology (using a wide range of microscopy methods). We can also characterise physical properties ranging from strength and toughness to optical or electrical properties. A strength of the Group is the ability to combine these skills and apply them to the development of understanding of the changes in structure or formulation that are required in order to achieve a particular desired physical property. A topical example would be in the understanding of the effect of the addition of nanoparticulate fillers to a polymer composite material. Here MSG is able to characterise all aspects of the problem, including the structure and size distributions of the fillers, how they are distributed within the composite matrix, the impact that their presence has on the processability of the composite, and the whether or not they have an advantageous effect on the final physical properties.

Appendix

MSG's technical capability is organised into a number of small teams, each focused on one area of expertise. These are described in detail below.

Spectroscopy & Imaging

a) Vibrational Spectroscopy

- FTIR spectroscopy (Rapid-scan and step-scan)
- Wide range of IR sampling techniques including internal reflection, external reflection, photoacoustic, diffuse reflectance, microscopy)
- Raman spectroscopy (dispersive, lasers@ 488nm, 532 nm, 633 nm and 785 nm laser excitation))
- Raman spectroscopy for process/in-situ analysis (reaction/reactor monitoring)
- Raman Microscopy and Mapping :production of chemical images with 1 micrometre spatial resolution
- FTIR Microscopy and mapping: analysis with ~ 10 micrometre spatial resolution
- FTIR Global Imaging – massively parallel data acquisition, rapid production of chemical images with ~ 5 micrometre spatial resolution
- Variable Temperature and Pressure Studies
- LC/GPC/GC FTIR
- DSC-Raman
- UV-Visible, including transmission, diffuse and specular reflectance measurements
- Chemometric multivariate techniques for analysis
- Surface-specific studies

b) Surface Science

- Secondary Ion Mass Spectrometry (SIMS):
 - Molecular identification of organics and inorganics
 - ppm sensitivity
 - 2d-imaging at 0.2 mm resolution
 - high mass resolution ($m/Dm > 10000$)
- X-Ray Photoelectron Spectroscopy (XPS):
 - High energy resolution, allowing for improved identification and differentiation of chemical functionality
 - High sensitivity, giving detection limits (0.1 atomic %) and fast analysis
 - Monochromated X-ray source resulting in simple spectra and reduced sample damage
 - High spatial resolution allowing for 2-D imaging at less than 10 um resolution
 - Cold-stage giving capability for studying volatiles / liquids

Molecular Spectroscopy

Component identification in complex mixtures
Reverse engineering of formulations/ products
Additive detection
Coating analysis/ identification

a) Nuclear Magnetic Resonance (NMR) Spectrometry

- Pulsed NMR for liquids
 - -500, 400 and 300 MHz spectrometers
 - -1H,13C,31P nuclei (and others upon request)
- Modern 1-D and 2-D data processing

- GPC-NMR
- Access to Solid State NMR

b) Mass Spectrometry (routine and high sensitivity)

- Hyphenated techniques including GC-MS, LC-MS, CE-MS and GPC-MS
- Thermal desorption-GC-MS (up to pyrolysis temperatures)
- Ionisation techniques include: EI, CI, FD, FI, LSIMS, MALDI, ESI and APCI
- Tandem mass spectrometry (high and low energy collision induced dissociation (CID) with all ionisation techniques)

Separation Science

Quantitative analysis of organic compounds and ions in all types of sample

Smell, taint, volatiles, colour, gas analysis

Air, effluent and soil analysis

Polymer identification and additives in polymers

Polymer molecular weight distribution (GPC)

Setting up of analysers. Fast GC systems.

a) Gas chromatography and supercritical fluid chromatography

- Gas chromatography (GC)
- Thermal Desorption-GC
- Pyrolysis GC-MS
- Headspace GC
- Analytical preparative scale GC
- Multi-dimensional GC systems
- Gas chromatography-mass spectrometry
- Supercritical fluid extraction
- Supercritical fluid chromatography (packed and capillary systems)

b) Liquid Chromatography

- High Performance Liquid Chromatography
- Gel permeation / size exclusion chromatography
- Ion chromatography
- Capillary electrophoresis
- Analytical preparative scale liquid chromatography
- Derivatisation techniques

Inorganic & X-Ray Analysis

Detection capabilities range from the ultra-trace to minor and major component levels involving quantitative, semi-quantitative or qualitative measurement interpretation modes. Speciation of analytes by chromatographic separation prior to ICP-MS.

a) X-ray Fluorescence Spectrometry

- Wavelength Dispersive XRF

b) Atomic Spectrometry

- Dynamic Reaction Cell Inductively Coupled Plasma-Mass Spectrometry
 - Laser ablation
 - HPLC/Ion Chromatography for speciation
 - Microconcentric nebulisation
- ICP-OES (Dual View)

- Ultrasonic nebulisation
- AAS
 - Flame Pyrolysis for Hg
- AFS
 - Cold vapour
 - Hydride

c) Combustion Techniques

- Microanalysis (C,H,N,S,O)
- Macroanalysis (C,S)
- Chemiluminescence (N)
- Microcoulometry (S,Cl)

d) Chemical Techniques

- Moisture
- Gravimetry
- Metal Assay
- Ion Chromatography

e) X-ray Diffraction

Expertise in the analysis of both inorganic & polymeric materials:

- powder diffraction and phase identification
- texture and orientation analysis in polymer films
- small angle scattering (SAXS)
- capability for diffraction under controlled process conditions (temperature and environment)
- temperature-dependent structure determination
- structural modelling

In addition, we have strong links with high intensity sources at Daresbury and Grenoble

Chemical Analysis & Product Regulatory

This area assesses regulatory compliance of their products for use in contact with food and potable water and for use in the manufacture of toys and in pharmaceutical packaging and medical applications.

Determination of migration from materials and articles intended to come into contact with foodstuffs. The studies carried out are in support of existing regulations worldwide or in support of petitions for new products. All of the migration studies are carried out according to the principles of GLP and to UKAS requirements. Thus all studies are subject to Quality Assurance auditing and the calibration of equipment can be traced to national standards.

a) Plastics Analysis

Identification and measurement of a variety of plastics, including polymers, impact modifiers, lubricants, heat & light stabilisers and anti-static agents.

Separation of constituents employing a variety of extraction technologies

Analysis of individual components by a wide range of analytical techniques e.g. Colorimetry, titrimetry, FT-IR, HPLC, TLC, Gravimetry, electrochemistry

b) Chemicals Analysis

- Analytical and Separation Methodologies for identification and quantification of a wide range of products.
- Titrimetric Analysis
- Physical properties
- Separation procedures
- Electrochemical analysis
- Moisture determination
- Flow injection analysis

Microscopy

a) Electron Microscopy

- SEM of polymers and inorganics. Analytical capability (EDX). Image analysis to provide quantification of images.
- Cryo-SEM for soft or wet samples
- TEM, also of polymers and inorganic materials. Microanalysis capability (nm resolution)
- Structural modelling as an aid to interpretation
- Access to Environmental SEM (ESEM) via academic links

b) Optical Microscopy

- Reflection & Transmission Optical Microscopy
- Confocal Scanning Light Microscopy
- Image Analysis - particularly as applied in production environments
- Determination and modelling of optical properties of films and surfaces, such as gloss, haze, clarity etc.
- Colour determination and analysis

c) Contamination Analysis

- Analytical Microscopy, particularly as applied to process and product problems.
- Contamination audits and consultancy
- SEM-EDX

Physical Properties

a) Thermal Analysis

A wide range of thermal analysis methods are applicable to the investigation of thermal stability, physical properties, structure-property relationships, process history etc.:

- Differential Scanning Calorimetry (DSC) and modulated-DSC
- Thermogravimetry (TG):
- Thermomechanical Analysis (TMA)
- Dynamic Mechanical Analysis (DMTA)
- Dielectric Thermal Analysis (DETA)
- hot stage microscopy

b) Particle Sizing

- Light scattering methods, as applied to solutions and dry powders
- Image analysis on optical and electron microscopy images
- Consultancy on On-line and at-line approaches

c) Misc. Physical Properties

- Surface energy measurement
- Contact angle determination
- Wetting studies

d) Electrical Properties

- Determination of electrical parameters of solids and liquids, over the temperature range -100°C to +300°C:
 - volume resistivity
 - surface resistivity
 - dielectric permittivity and loss
 - dielectric spectroscopy
- Electrostatics troubleshooting, charge mapping and charge decay measurements.

Materials Properties & Processing

a) Mechanical Properties and Tribology

- stress-strain behaviour characterisation in tension, compression and flexure
- high speed testing
- mechanical testing in environments
- non-contacting extensometry
- tensile dilatometry
- yield stress
- torsional testing
- hardness testing
- pendulum impact testing
- instrument falling weight impact testing
- linear elastic fracture mechanics
- elastic-plastic fracture mechanics
- fatigue testing
- environmental stress cracking
- creep & creep rupture (including under ultra-violet light weathering)
- adhesion tests
- mechanics modelling

b) Tribology

- instrumented scratch resistance measurement
- wear studies & abrasion testing
- friction measurement

c) Rheology & Processing

- process simulation
- capillary rheology
- Polymer Melt-flow index
-

If there is any interest in any of the above services, please address your enquiries to Allan Stewart or Isla Mathieson at the following numbers.

Telephone: (44) (0)1642 435788

Facsimile: (44) (0)1642 435777

E-mail: msgenquiry@intertek.com