MCS Analysis Capabilities

Technique	Tool	Summary Description
FEG-SEM	Zeiss Sigma FEG-SEM - Very high magnification and resolution imaging and analysis.	Extreme high mag and resolution (1.4nm resolution), with very low beam currents
EDX	Oxford EDX Elemental Analysis (Oxford Aztec with 80mm2 X-Max detector)	Excellent light element capability and high spatial resolution, real high resolution element mapping down to 2kV
VP-SEM	Zeiss EVO VP-SEM (Non-Conductive and extended pressure imaging)	Ideal for high mag imaging of non-conductive or out-gassing samples
EDX	Oxford EDX Elemental Analysis (Oxford INCA with 50mm2 X-Max detector)	Used for element analysis and mapping on non-conductive samples
FT-IR	JASCO 6100 Fourier-transform Infra-Red spectroscopy (Micro and Macro scale) with IRT-5000 FTIR microscope	Extremely powerful analytical tool for organic and inorganic materials. Can handle bulk or microscopic samples
AES (Static and Depth profile)	JEOL Jamp 10s Auger Electron Spectroscopy - surface elemental analysis	Surface analysis or depth profile modes. AES provides information about the chemical composition of the outermost material, excellent spatial resolution (< 1 µm), surface sensitivity (~20 Å)
XPS (Static and Depth profile)	Thermo Fisher ESCALAB 250 X-Ray Photoelectron Spectroscopy - surface analysis including state information	Surface analysis or depth profile modes, measures the elemental composition, and chemical state of the elements that exist within top 1-10nm of a material.
SIMS (Static and Depth profile)	Cameca ims 4f and ims 3f Secondary Ionisation Mass Spectroscopy - surface analysis and depth	Surface analysis or depth profile mode - extremely high sensitivity for all elements (ppm – ppb)
Ion Chromatography	Ion Chromatography (ionic cleanliness)	Analysis of molecular species rather than elements, Analysis of halides, anions and elements not available by ICP or XRF. Trace analysis of any material that can be digested into an aqueous matrix.
ICP-OES	Perkin-Elmer Optima 7000DV Inductively Coupled Plasma Optical Emission Spectroscopy	Trace analysis of inorganic materials, down to parts per million (ppm) or less.
Broad Ion-Beam (BIB) Processing	Leica TIC3x - specialist ion beam cutting including cryo-stage	Ion beam micro-section preparation tool. Ideal for failure analysis and QA. Produces very large (mm's) x-section which are free from artefacts. Ideal for delicate and difficult samples preparation including thin film, semiconductor, polymer and many other applications.

Table 1. Summary of analysis and test capabilities at MCS.

Continued overleaf /

MCS Analysis Capabilities

Technique	Tool	Summary Description
Micro-section preparation	Full suite of Buehler materialographic preparation tools including diamond precision saws, lapping, polishing, vibratory polishing, etching etc.	Exceptional preparation skills for difficult to work with samples. Use both mechanical and ion-beam methods. Evaluation of metallic components, joining techniques and coatings. Quality or workmanship of welds and brazes. Determine if components have been manufactured to specification. Conduct failure analysis. Verification of coating quality etc.
Beryllia Micro-Section Preparation	Micro-section preparation suite for hazardous material - Beryllia (BeO)	Preparation and analysis of electronics built using Beryllia (often found in hybrid and high power / high temperature systems).
Micro-Mechanical testing	Dage 4000 Multi-tester, Instron 5542 Universal Tester for die shear, bond shear, wire bond pull	Multi-purpose mechanical test tools which are capable of performing all pull and shear applications
High and low power light microscopy	Range of tools including Leica DMR, Olympus, Nikon SZ-40, measuring 'scopes Bright-field, dark-field, polarised light.	Optical microscopes used for microstructural evaluation, failure analysis, dimensional measurements and wide range of materials characterisation.
Metallography	Characterisation of metals and interconnections (all)	These techniques are utilized to perform metallographic evaluation, measurement of features, material characterisation, automated image analyses, contaminant identification and failure analyses. Good materialographic preparation techniques are essential to obtaining accurate analyses results.
Materialography	Characterisation of polymers, ceramics and composites (all)	
Microhardness	Buehler micro-hardness tool fitted with Knoop indenter	Used to determine mechanical properties in small samples or layers. When testing metals, indentation hardness correlates linearly with tensile strength.
X-ray	Dage XiDat 6500 digital x-ray inspection	High resolution micro-focus X-ray systems for QA and failure analysis. Ideal for semiconductor and electronics industries.
System level electrical test	Agilent oscilloscopes and meters for basic electrical test to support failure analysis (system level),	Electrical testing to de-bug functional failure at component and system level, characterisation of passive devices.
Component Authenticity Testing	Marking permanency, re-packaging, die surface inspection (acid de-cap)	Suite of tests allow rapid and reliable check on component identity and authenticity.
Environmental Testing	Votsch Environmental Chambers for Heat, humidity, thermal cycling, thermal shock	Environmental test capability with wide range of heat and humidity capabilities. Electrical feed-through for powered testing.

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