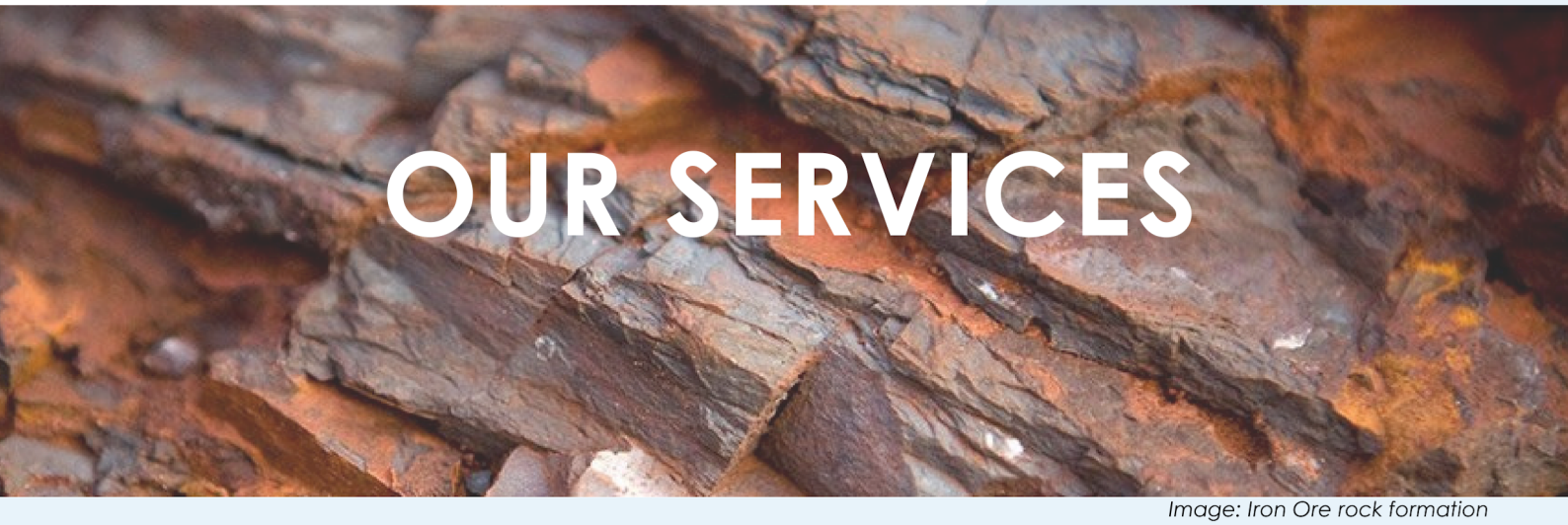
microanalysis australia



OUR SERVICES

Image: Iron Ore rock formation

Areas of our expertise

Microanalysis Australia is a NATA accredited Laboratory, leveraging scientific methodologies and cutting-edge equipment to drive our analyses. Our focus is on delving into the micro to unravel the macro, providing our clients valuable insight for informed decision making.

Our laboratory offers a diverse array of instrumental, physical, and chemical techniques, encompassing scanning electron microscopy, X-ray diffraction, particle sizing, gas chromatogram – mass spectrometery, petrography, and hazardous goods testing. Beyond our suite of standard tests, outlined below, we have the expertise to collaborate with you on intricate projects or challenges. We assist in developing testing matrices and decoding results to cater to your unique requirements.

Our true value to our clients is in the interpretation and analysis of results. Whether you seek analytical or chemical analysis, inspections, certification, forensic testing, verification, or training, our team of multi-disciplinary scientists possesses the knowledge to obtain profound insights.

Summary of our standard tests:

- Shipping declarations for dangerous goods.
- MSDS creation.
- Risk assessment for asbestiform and low-biosolubility , respirable fibres.
- Metallurgical failure and corrosion mechanisms.
- Condition monitoring of fuels, oils and lubricants including identification of contaminants.
- Petrographic analysis of core samples for geological modelling
- Forensic analysis of airborne dusts, detailing hazards and potential sources
- Scrubber optimisation from characterisation of stack emissions.
- Dredge soil characterisation for plume modelling.
- Concentrate dissolution testing for bioavailability reporting.
- Civil engineering materials fitness -for-purpose testing.
- Testing standards development.
- Research and development.

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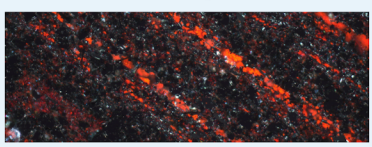
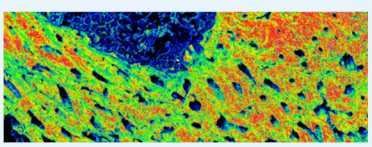
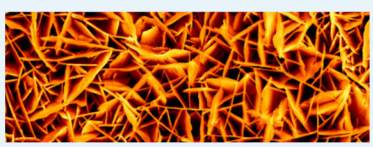
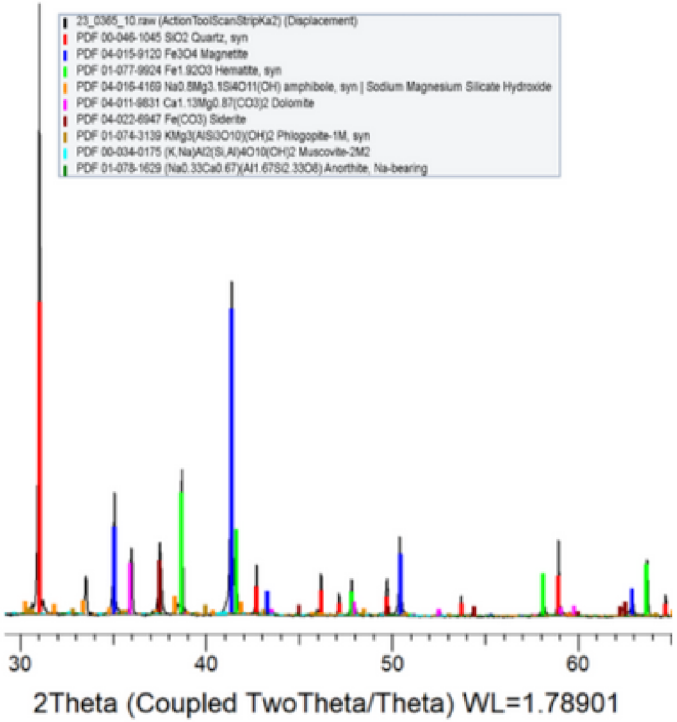






X-Ray Diffraction

X-Ray Diffraction (XRD) is a technique for examining the arrangement of atoms in a crystal lattice. This is a comparative technique where the pattern obtained for a sample is compared against a standards database. Elemental composition is not determined by XRD but can be inferred from the results. XRD analysis can be performed on any crystalline solids ranging from single minerals and crystals, pre-pulped assay samples, and whole rocks or drill core. The ultimate goal of XRD in all these cases is to identify phases present and their abundances.

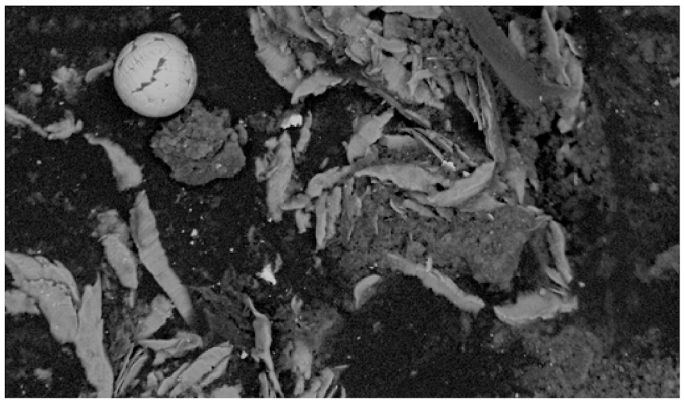


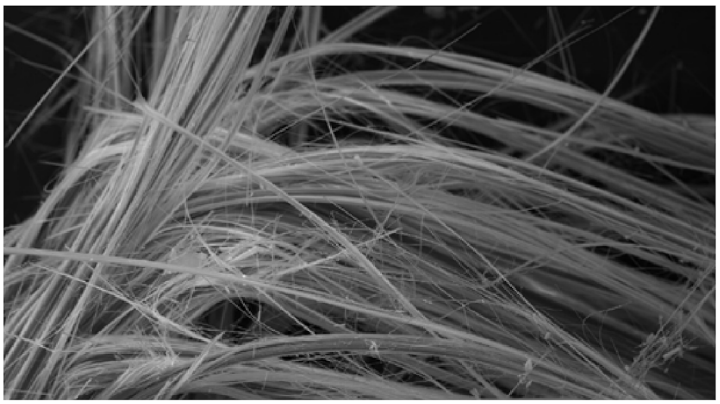
Other information that can be gleaned from an XRD trace includes the degree of weathering or alteration, crystallite size, substitution, degree of disorder and the amorphous content.

Scanning Electron Microscope (SEM)

Microanalysis Australia uses Scanning Electron Microscopy and associated techniques to deliver both routine and specially tailored analysis to a wide range of industries including exploration, mining, construction, and research. We were the first laboratory in Australia to be NATA accredited for asbestos counting and identification on filters using SEM techniques.

Our scanning electron microscopes can provide non-destructive, high-resolution imaging and fast chemical (elemental) analysis of a wide range of materials. Using a combination of analytical expertise and state-of-the-art instruments and software, we have the capability for in-depth materials characterisation including: asbestos identification and quantification, ore characterisation with liberation analysis, failure and wear investigation, asset maintenance, and much more.





Images: Top: XRD results showing mineral breakdown; Bottom Left: SEM image - wear particle analysis from transmission fluid; Bottom Right: SEM image of asbestos fibers.

Gas Chromatography – Mass Spectrometry (GC-MS)

Gas Chromatography Mass Spectrometry (GC-MS) analysis is utilised for volatile organic and inorganic samples that may come from fuels, pharmaceutics, food, beverage, fragrances, forensic, biological, chemical warfare, and geochemical or environmental research. Analysis by GC-MS involves vaporisation of a sample into a gas phase and its separation into constituent components. A mass spectrometer then breaks components into ionised fragments for analysis. This process allows identification of individual components and quantification. It is a highly useful analytical tool for positively identifying the presence of a particular substance.

Transportable Moisture Limits (TML)

Without TML reporting a ship containing bulk cargo cannot leave port. The TML value represents a 'safe' moisture content, below which the cargo is unlikely to undergo liquefaction and endanger the ship and crew. It is the responsibility of the shipper to provide a moisture management plan and to prove that the cargo is being shipped with a moisture content below the TML.

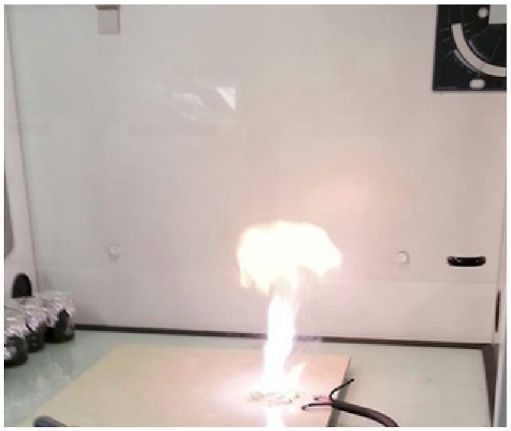
Microanalysis Australia performs classification testing for IMDG and IMSBC requirements, as well as testing during process development to ensure that the product will be easy to ship and compliant with Port Authorities, MARPOL, and AMSA regulations.

Microanalysis Australia establishes sample stability as recommended in the International Maritime Organisation's IMSBC code through:

- Flow table test, using impact testing to simulate plastic flow.
- Proctor-Fagerberg test, based on a standard soil compaction test to determine saturation point;.
- Bulk density/stowage factor, moisture determination, and angle of repose.
- Dust extinction moisture content (DEM).
- Classification of iron ore, using particle sizing and mineralogy by X-ray Diffraction (XRD)
- Particle sizing by laser diffraction using the Malvern Mastersizer.

Image: Top: GC-MS equipment; Middle: Preparation for TML testing; Bottom: Measuring compound after TML testing

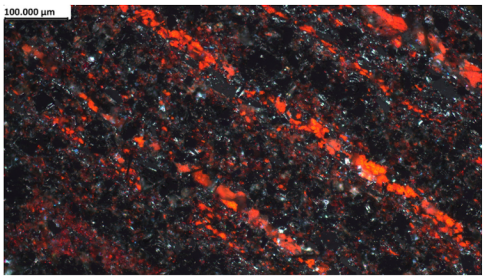
Dangerous Goods (DG)

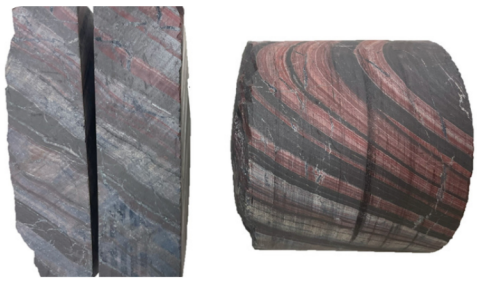


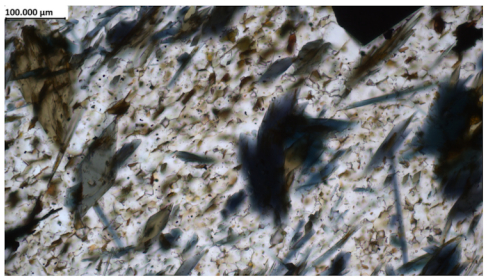
For Dangerous Goods testing the following tests are conducted;

- Class 4.1 Readily Combustible Solids (Flammability) including MHB CB
- Class 4.2 Pyrophoric Solids and Self-Heating (Self Reactive Substances) including MHB SH
- Class 4.3 Evolution of gases and water reactive substances including MHB WF
- Class 5.1 Oxidising Solids
- Class 6 Toxicity (multiple techniques)
- Class 7 Radioactivity
- Class 8 Corrosivity – Dermal Corrosivity and Corrosive to Metals including MHB CR
- Dissolution testing (Marine/Freshwater) for ecotoxicity assessment
- Respirable and Total Crystalline Silica

Each technique is uniquely suited to certain sample types, so explicit knowledge of the sample and the test specifics are paramount to an easy journey out of the port.







Petrography

The analysis of whole rock and thin sections by combined stereoscopic and petrographic microscopy is a valuable tool for mineral identification, liberation assessment, ore characterization, process optimization, quality control, environmental impact assessment, and research and development. It plays a crucial role in maximising the economic value of iron ore deposits and ensuring sustainable mining practices. Most crucially, petrographic analysis provides insights into the texture, structure, and composition of iron ore deposits. This information helps geologists and mining engineers better understand the ore body's genesis, depositional environment, and alteration history. Such knowledge aids in ore body modelling, mine planning, and resource estimation. Analysis can be undertaken on whole rock, crushed rock, core, and together with complimentary SEM-EDS, XRD and other characterisation techniques.

Image: Top right: Class 5.1 Oxidising solids test; Left top to bottom: Top: Massive iron oxide band with magnetite (black) and haematite (red; RXL, 20x); Middle: Core samples are assessed on receipt and optimal areas are selected for cutting and sectioning; Bottom: High magnification of subhedral isometric magnetite (purple-grey) and irregular haematite (blue-grey; RL, 50x).

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