

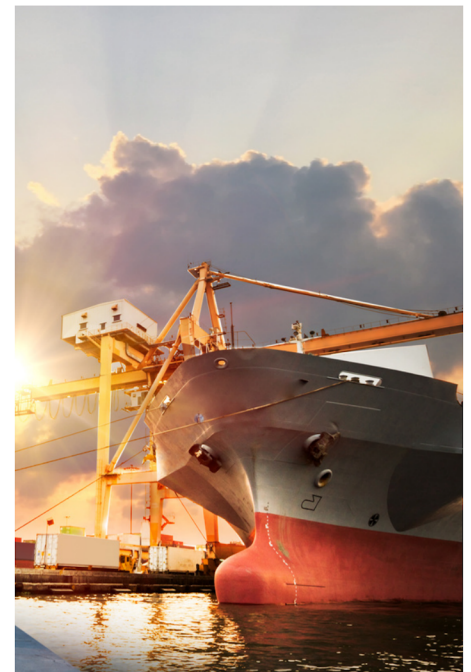


SHIPPING, TRANSPORT, HANDLING, AND DISPOSAL

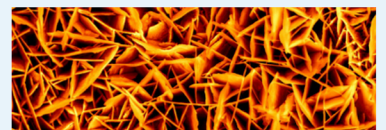
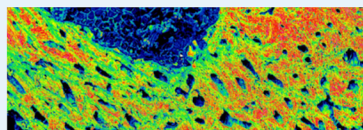
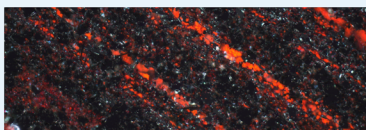
Image: Iron Ore rock formation

Transportable Moisture Limits (TML) and Dangerous Goods (DG)

Microanalysis is one of Australia's leading experts in determining Transportable Moisture Limits (TML) and a suite of tests that are essential in classifying and exporting bulk materials and dangerous goods. Microanalysis has worked closely with the mining industry to develop testing procedures that have been accredited through the National Association of Testing Authorities (NATA) to ensure compliance with various product standards and international shipping regulations. Microanalysis provides certified and reliable shipping declaration testing for the export of bulk ores.

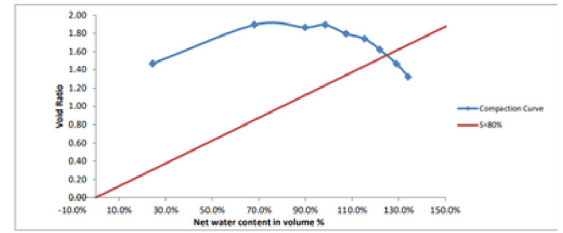


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TML

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 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 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 and NATA accredited sieving between 38 μm and 32 mm.

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.
- SDS development and associated testing.

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. Microanalysis are experts in understanding your shipping needs and tailor our analyses to your specific cargos.

In May 2019 Microanalysis received National Association of Testing Authorities (NATA) Accreditation for their TML testing for solid bulk cargoes susceptible to liquefaction and associated tests, by both the Flow Table and Proctor-Fagerberg method.



Images: Top: the TML is determined by the intersection of the compaction curve with the line of the degree of saturation $S=80\%$; Middle: TML test preparation; Bottom: Class 5.1 Oxidising solids test.