



SCANNING ELECTRON MICROSCOPY (SEM)

SEM

Microanalysis Australia is a NATA accredited laboratory and has been offering Scanning Electron Microscopy (SEM) services to numerous industries, including exploration, mining, construction, and the research industry for over a decade.

Scanning Electron Microscopy uses a high energy beam of electrons that can be focused onto a spot approximately 1 nanometer in diameter, resulting in images with resolutions of better than 10 nm, wide depth of field and characteristic x-ray emission gives detail of the spatial and textural relationship of the elements.

Image: Iron Ore rock formation

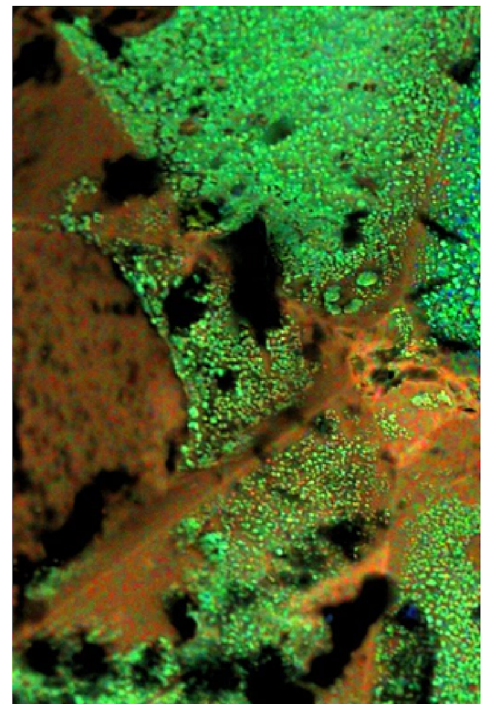
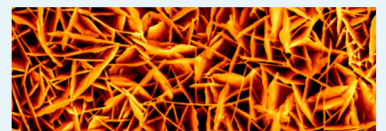
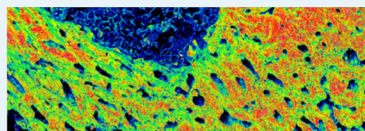
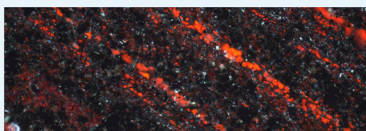
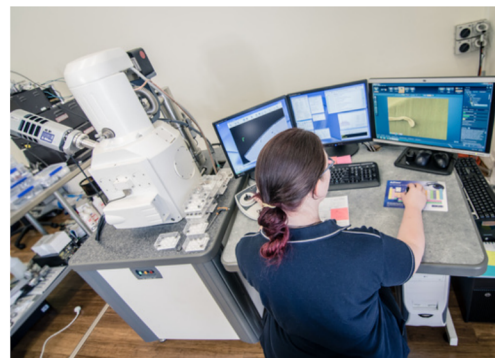


Image: Apex of a gem at a higher magnification, showing the texture of the silver residue and the imperfection of the point. The colour range has been selected to highlight the silver and lead (green) against the carbon (orange).



SEM uses a high energy beam of electrons that can be focused onto a spot ~1 nm in diameter, allowing resolution limits down to ~10 nm. SEM offers non-destructive, high-resolution imaging via;

Secondary electron detection (emphasising topographical features): Secondary electrons originate from either the surface or near-surface regions of the sample and are beneficial for inspection of the sample topography.



Backscatter electron detection (emphasising compositional variation): Backscatter electrons penetrate deeper into the sample giving information on elemental composition. Backscattered electrons can be used to form an electron backscatter diffraction (EBSD) image for determination of crystallographic structures.



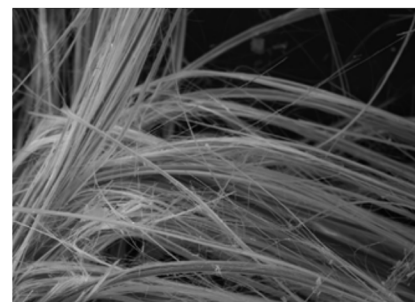
Energy dispersive spectroscopy (EDS) (compositional analysis): EDS provides fast chemical (elemental) analysis of the field-of-view or point-by-point to a spatial resolution of ~4 μm . This technique captures the release of characteristic X-rays created by electrons from the incident beam colliding with atoms. The radiation is unique for every element. Our EDS detector can detect elements from boron onwards.

X-ray mapping/Phase mapping: X-ray mapping via EDS determines elemental distributions within the sample and this information can be further processed into phase-mapping, which allows us to look at the correlation between the elements and build ternary diagrams to give information about compounds and the relationships between elements that are present.

Microanalysis has the capability for in-depth, automated particle sizing, compositional analysis and mineralogical analysis via 'Feature' and 'Aztec Mineral' software. These fully automated image recognition software packages collect data on >10,000 particles for size distribution and composition analysis. The comparison of elemental ratios together with mineralogical information allows for mineral categorisation according to set criteria and allows reporting of sizes by composition. Aztec Mineral allows individual grains to be completely characterised for mineral abundance, mineral associations, and liberation yields.

Microanalysis provides many services to the mining and resources industry ranging from:

- Soil, rock, and construction material analysis
- Asbestos testing (NATA accredited for filter samples)
- Filter analysis
- Paint particle and fibre analysis
- Asset Maintenance
- Failure analysis
- Precious metal recovery/base metal recovery



In addition to the SEM analysis that Microanalysis offers, samples can also be assessed inhouse with complimentary specialist techniques including XRD (X-ray diffraction) and petrographic approaches.

Image:Top: Analysts operating SEM; Middle: SEM image - wear particle analysis from transmission fluid; Bottom: SEM image - Asbestos fibers.

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