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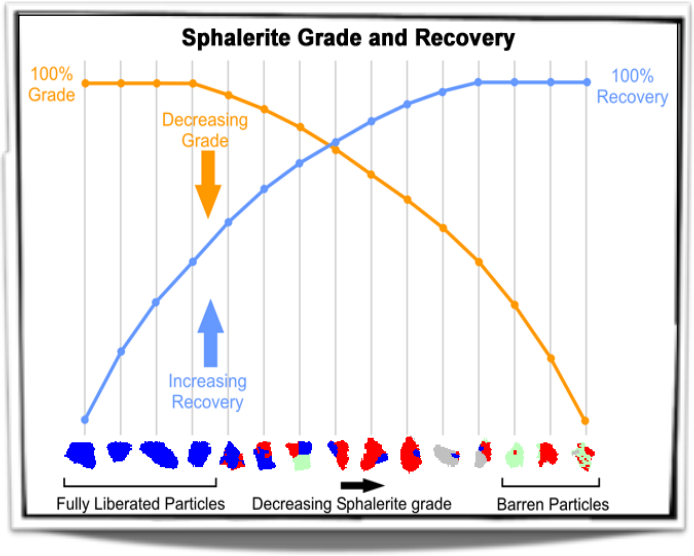
Applied Mineralogy

Applied Mineralogy is a discipline of mineralogy by which the unknowns and problems encountered during mining and processing steps can be approached and solved. From the very first stages of exploration to the final refining process, Applied Mineralogy provides the information required to make decisions on how a mining project shall proceed to the next phase. Mineralogy is essential to characterise the ore body, identify and quantify target minerals and their associated gangues, and reveal the liberation, locking and grain size of the target phases. For a constant optimisation of recovery and mineral processing plans, applied mineralogy is essential.



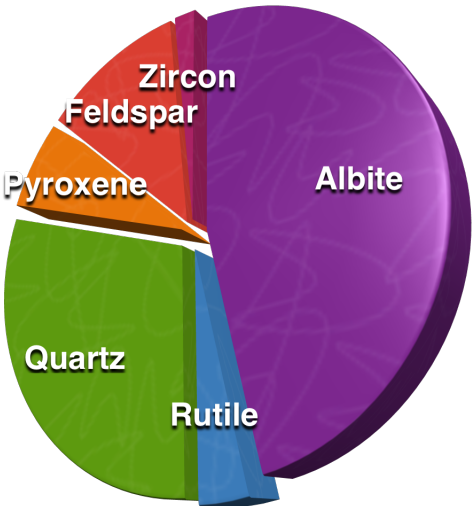
Applied Mineralogy Equipment At Actlabs

FEG-QEMSCAN and FEG-MLA at Actlabs

Applied Mineralogy department at Actlabs uses the latest analytical instruments for automated mineralogy investigations. This includes one FEI QEMSCAN 650 F, and one FEI MLA QUANTA 650 F, in addition to a Panalytical X'PERT PRO XRD. For petrographic studies transmitted/reflective microscope (Olympus BX51) is available for studying polished thin sections; they can also be analysed and mapped by QEMSCAN or MLA.

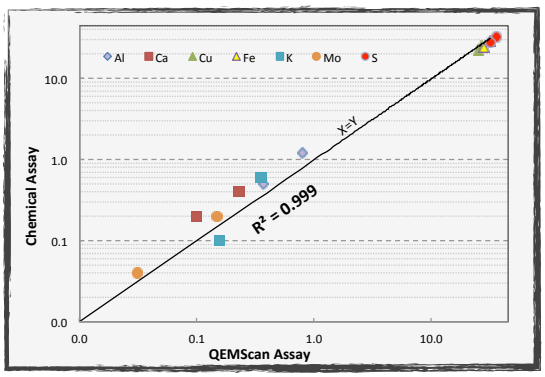
Applied Mineralogy Services At Actlabs

Modal Mineralogy Analysis:



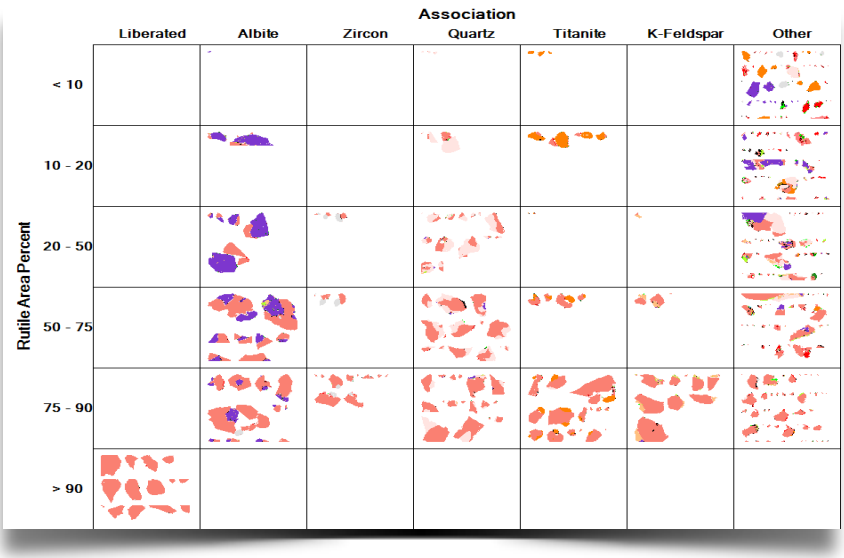
Whether the sample is drill core, rock chips or concentrate, this method is a rapid and efficient solution for identifying and quantifying the constitutional minerals. Elemental Deportment and Chemical Assay reconciliation can also be provided using this method. This analysis can also be performed on polished thin sections complementary to petrographical studies.

In order to verify the validity of modal mineralogy analysis, we reconcile the major elements calculated from modal mineralogy analysis with those by chemical assays and compare the results in an Assay vs QEMSCAN diagram.



Particles and Grains Characterization:

This type of analysis provides full textural quantification data and particle classified digital images, which are used for studying locking, liberation and association characteristics as well as size distribution of the minerals of interest.

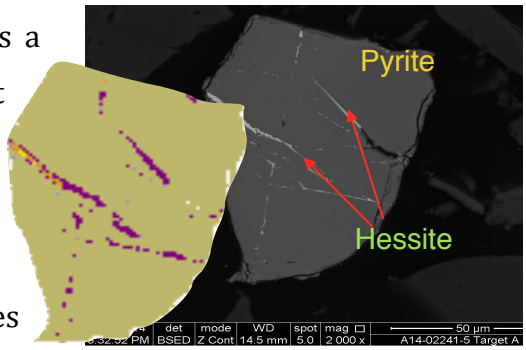


Liberation data are essential for plant design and mineral processing projects, as well recovery optimisation.

This mode of analysis can also demonstrate the size ranges of the highest abundances of the target minerals (i.e. size distribution); or how long an ore shall be ground to achieve highest liberated amount of the target mineral.

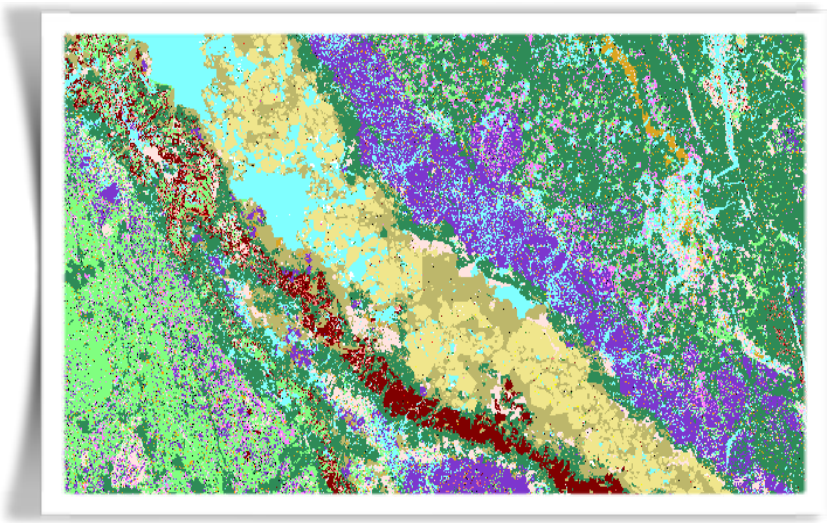
Trace Mineral Search (Packages for Precious Metal Studies):

This type of analysis is designed to investigate PGM, REE minerals, low grade ores, trace and tracer phases. This is a rapid mode for finding and characterizing the target minerals. Once phases have been identified data such as grain size distribution, classified images and particle counts can be obtained on those specific phases.



Actlabs has extensive experience in mineralogical analyses of precious metals. Using FEG (**F**ield **E**mission **G**un) equipped QEMSCAN/MLA, we are able to detect and characterise fine micron-sized or sub micron sized Gold or Silver particles encapsulated in pyrite, quartz and/or other minerals. Gold and Silver mineralogical services at Actlabs have helped several mineral processing projects to improve their recovery by mineralogical characterisation of the unrecovered Au/Ag portion of the sample.

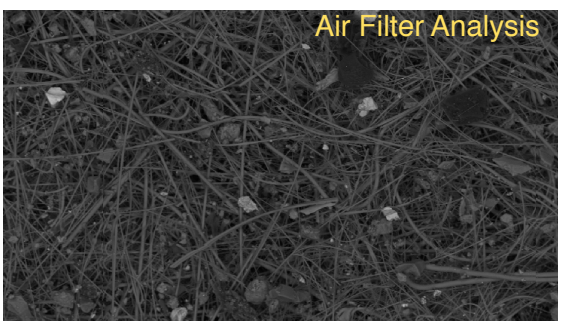
Field Scan Mapping:



This is a high definition, detailed mineralogical map of a polished section; this analysis can be performed on a standard thin section or a thick section; this mode of measurement can provide extensive mineralogical data on the rock texture and association of the co-existing minerals.

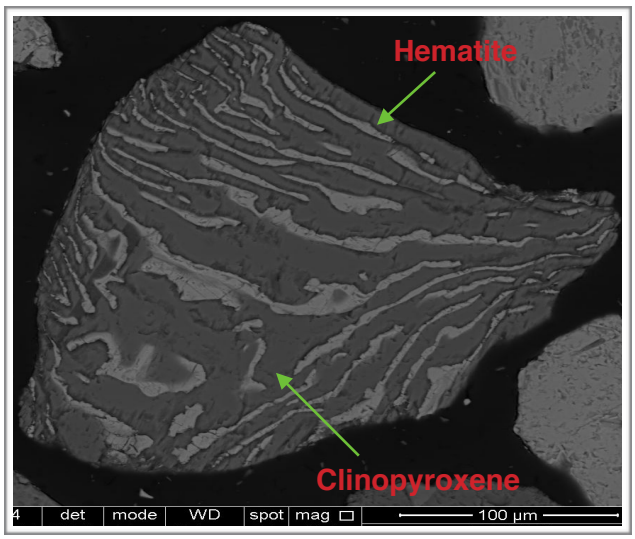
Manual Imaging & Spectrum, Elemental Mapping (Fusion Study):

For materials testing purposes as well as environmental projects, manual investigations using high resolution SEM for BSE/SE imaging and EDS spectra analysis is necessary. Also, with the elemental mapping option, we are able to perform investigation related to fusion studies and high tech alloy projects.



Complementary Techniques:

In addition to mentioned mineralogical services, Actlabs also provides Laser Ablation ICP-MS as well as Electron Probe Microanalyzer (EPMA), which can be used for accurate in-situ major and trace elements analysis, as a complement to high definition mineralogical analysis. The data produced by EPMA and L.A ICP-MS are key to better understating the trace elements distribution in the target minerals, e.g to determine the presence of the invisible gold (chemically bound) in the sulfide phases.



Analytical Packages At Applied Mineralogy Department

Package Code	Investigation Phase	XRD Cluster Analysis with XRF Major Elements	Modal Mineralogy, Assay Reconciliation & Elemental Deportment	Liberation, Association and Size Distribution	Theoretical Grade Ore Recovery and Ore Characterization	Specific Mineral Search (For Preciuos Metals)	Trace Mineral Search	High Resolution Field Scanning
Expo 1	Prelim Exploration	x	x					
Expo 2	Advanced Exploration	x	x	x	x	x	x	
Meta 1	Plant Design Studies	x	x	x	x	x	x	
Meta 2	Ore Recovery Optimisation	x		x	x	x	x	
Meta 3	Production Monitoring	x	x			x	x	
Petro 1	Detailed Research: Standard thin section analysis		x			x	x	x
Petro 2	Research: Standard thin section analysis		x					
Petro 3	Geotechnical Studies: **Porosity** and **Roundness**		x	x				

All the above packages can be quoted and described in further detail as necessary. We customise the packages based on the aim of each project in order to have a comprehensive cost effective set of data. Example reports can be sent upon request.