

ADVANCED MINERALOGY FOR IRON ORE

SGS ADVANCED MINERALOGY SERVICES



SGS CAPABILITIES

SGS is the industry leader in Advanced Mineralogy for the global minerals industry and other market sectors that need detailed material, product or residue characterizations. Our analytical experts deliver comprehensive High Definition Mineralogy services through our global Advanced Mineralogy Network. We provide a wide spectrum of services that, at the broadest level, includes:

- Mineral and phase determinations
- Particle identification and characterization
- Microchemical analysis
- Digital imaging.

Most beneficiation plants separate the valuable minerals from the waste minerals by physical means. Understanding the mineralogy textures and grain size distribution is paramount for this activity. Understanding how the ore and gangue minerals behave in the metallurgical processing requires qualitative and quantitative knowledge of the ore and waste minerals present and their textures and associations.

To provide this objective data, SGS Minerals Services offers:

- X-ray diffraction
- Electron microprobe microscopy
- High Definition Mineralogy
- Image analysis
- Optical microscopy

QEMSCAN

High Definition Mineralogy using QEMSCAN® can be used for iron ore as it can examine a large amount of particles and can therefore provide statistically meaningful quantitative data. In addition, it produces digital data, which can be sorted using a computer program. For instance, it is possible to sort the particles by their specific gravity, based on the specific gravity of the minerals making up the grains (particles). The advanced characterization available from the SGS Advanced Mineralogy Facilities (AMF) provides the following advantages:

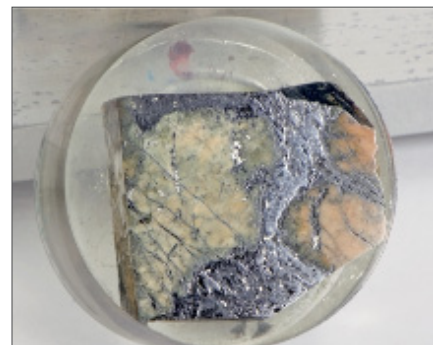
- Characterisation of raw materials
- Selection of suitable raw materials
- Comparison of different ore types
- Quality control of raw materials
- Identification of deleterious and pay elements
- Monitoring of product consistency and quality

In addition to basic compositional analysis, SGS can provide comprehensive analytical overviews of mineralogical characteristics and their influence on metallurgical properties including:

- Reduction Disintegration Index (RDI)
- Tumble Index (TI)
- Reducibility Index (RI)
- Cold Strength

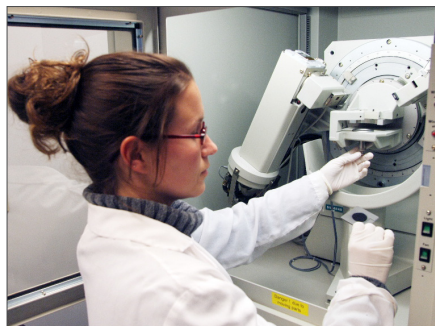
EXPLORATION MINERALOGY (EXPLOMIN™)

EXPLOMIN™ is a suite of packages developed by SGS which provide rapid, automated mineralogy for exploration and early project development purposes. EXPLOMIN™ data is generated by QEMSCAN™ on “whole rock” samples. It provides you extremely detailed and automated sample documentation of mineralogy, alteration and textures. The major penalty minerals including aluminum, phosphorus, sulphur, and silicon are easily identified, as are the phases of typical gangue minerals like carbonates, clays, chlorite, feldspars, and quartz.



Automated, accurate, and affordable, EXPLOMIN™ can provide you with unparalleled:

- Mineral identification
- Modal mineralogy
- Mineral associations
- Grain size and abundance
- Particle size, shape factors
- Deportment analysis
- Liberation information
- Deleterious minerals and environmental parameters
- False color image (jpg or bitmap) for textural interpretation.



X-RAY DIFFRACTION (XRD)

SGS offers semi-quantitative bulk modal analysis using X-ray diffraction (XRD). XRD allows us to determine bulk mineralogical assemblages and phase compositions, typically in very fine-grained materials. For standard XRD analysis, sample preparation is routine and data is acquired efficiently and accurately.

SGS XRD analyses reveal detailed information about the chemical composition and crystallographic structure of your samples. It aids in mineral identification and provides a semi-quantitative method for determining weight percentages of the minerals present, including the fraction of each mineral phase occurring in your samples.

ELECTRON MICROPROBE

Our analytical capability includes determining chemistry of compounds composed of elements from sodium to uranium. Applications range from mineral exploration to process and industrial mineralogy.

Projects typically include:

- Provision of raw compositional data to support metal balancing in simple and complex sulphide, oxide and silicate ores
- Generation of X-ray maps to illustrate metal distribution within texturally and compositionally complex substrates, at high magnification

IMAGE ANALYSIS

SGS image analysis provides you with particle size, shape, texture, and locked and liberated characteristics on unconsolidated material, polished mounts and drill core. Our image analysis system utilizes Clemex Image Analysis software and Nikon petrographic and binocular microscopes. Image analysis has broad applications throughout the iron ore industry, and provides you with the detailed information required for informed iron ore exploration and metallurgical flowsheet decisions.

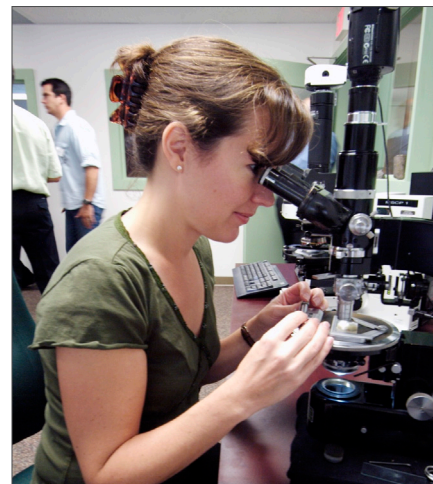
OPTICAL MICROSCOPY

Optical microscopy forms the basis of many of our mineralogical projects. We have a wide variety of research-quality reflected and transmitted light petrographic microscopes (Zeiss, Olympus and Nikon) including units with electronic cameras for image grabbing. Our Automatic Digital Imaging System (ADIS) produces fast and accurate mineral size distribution and mineralogical association data. ADIS can provide you with accurate characterization of iron ore bearing materials and process products in support of your mineral testing program, including:

- Accurate size and area measurements of the iron ore bearing and gangue materials
- Detailed frequency and mineral size distribution
- Iron ore deportment and association information.

CONCLUSION

SGS' Advanced Mineralogy services for iron ore range from basic compositional analysis through to a detailed overview of mineralogical characteristics and their influence on your metallurgical processes. Our analysis helps you make informed decisions regarding the optimization of



your comminution circuits, as well as your flotation, magnetic and gravity separation processes. The data provided by our AMFs can be integrated with your metallurgical test work to provide a comprehensive overview of the mineralogical characteristics and their influence on the metallurgical properties of your iron ore.

In addition to mineralogical analysis, we can further assist you with a plant audit to improve your metallurgical performance. If necessary, samples can be taken and metallurgical studies performed either on site or at our facilities. Further pilot plant studies (on or off site) can then be performed to optimize the critical steps in your operation. Whether your operation is a sinter, pellet, or lump ore facility, knowing the variability of your iron ores through consistent, mineralogical analyses allows you to predict ore behavior and facilitates effective, long-term ore recovery strategies. SGS Advanced Mineralogy experts are available globally to provide you with the technical support you need.

CONTACT INFORMATION

Email us at minerals@sgs.com
www.sgs.com/mining

SGS

WHEN YOU NEED TO BE SURE