

METALLURGICAL SCOPING STUDIES

GET TO KNOW YOUR DEPOSIT WITH SCOPING SERVICES FROM SGS

Scoping studies help create a general understanding of an ore body and outline the processes that could be used to extract the valuable minerals. The scoping study also provides a base from which to decide a budget and the possibility of future metallurgical tests. This initial work provides guidance to help lower overall cost of metallurgical testing and provides the metallurgical benchmarks for the orebody. Scoping studies provide:

- Understanding of the basic metallurgy of the ore and allow for a conceptual economic evaluation of the project.
- Understanding of the magnitude of costs for future testing to help with financing.
- Evaluate the metallurgical results before committing to the next phase of testing.

WHAT TYPE OF ORES CAN WE TEST?

SGS can provide a number of standard and specialty tests for scoping metallurgy. The choice of tests depends primarily on the type of deposit, the target commodity environmental drivers and investor requirements. We have specialized facilities to test all ore types. Some of these include:

- Base metal sulphides
- Base metal oxides
- Gold
- PGMs
- Industrial minerals and mineral sands
- Uranium
- Rare earths and exotics
- Iron ore
- Coal
- Diamonds

WHAT TYPE OF ACTIVITIES ARE CONSIDERED?

Mineralogical Characterization

This is the first phase of a typical scoping test work campaign. Its aim is to characterize the ore, identify any potential issues from the onset and answer some environmental questions. Mineralogical testwork provides a quantitative mineralogical assessment and provides details of how the target minerals manifest themselves in the ore. This examination also helps highlights any future process issues. For example:

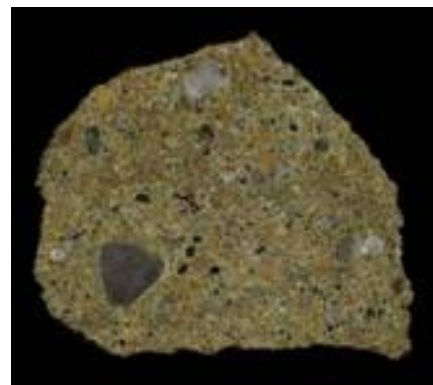
- Does the ore contain radioactive materials?
- Is there high arsenic?
- Are the minerals fine-grained?
- Could there be possible acid rock drainage issues?
- What are the regrind requirements?



Mineralogical work can help outline future metallurgical work to help with process development.

Preliminary Flowsheet Development

The exact flowsheet that is required often depends on the findings of the mineralogical characterization. Preliminary lab-scale tests can be



conducted to test the metallurgical response to the proposed flowsheet. Some of these tests include:

- Bench Scale Grinding Tests: A host of grinding tests are available to understand the work index, hardness, and abrasion indices of ore. Some these tests include Bond Work index tests, SAG Power Index tests (SPI), and JK grind tests. The information from the grinding work can provide an estimate of the energy requirements for a prospective plant and an understanding of the ore variability. Preliminary grinding flowsheet development can be leveraged from this type work.
- Bench Scale Magnetic, Electrostatic, Gravity Separation, Dense Media Separation: Separation of certain minerals can be efficiently achieved by taking advantage of their physical, electrical and magnetic properties. For example, mineral sands, coal, iron ore, and diamonds are some minerals that use at least one of these processes for a method of extraction. Conduct any of these common industry scoping tests at SGS' fully integrated facilities.

- **Bench Scale Flotation Tests:** Flotation testing starts by determining a suitable reagent suite for a particular ore. The preliminary flotation testwork helps validate liberation size requirements and reagent selection (collectors, modifiers, depressants). The results from these tests provide the potential grade-recovery relationship and pulp kinetics. This information can be used to size flotation equipment, evaluate the best grind size/regrind requirements, and flotation circuit requirements.
- **Bench Scale Hydrometallurgical Test Work:** Leaching rates, reagent consumption, temperature requirements and gas/pressure requirements can be determined through hydrometallurgical leaching test work including bench-scale autoclave work. Conducting metallurgical leach testing can provide an indication of reagent costs, equipment requirements, indication of metallurgical amenability to leaching and also provide environmental considerations due to deleterious elements or even acid rock drainage.

WHY CHOOSE SGS FOR YOUR METALLURGICAL STUDIES?

SGS is the world leader in metallurgical testing services for the mining and minerals industry. Our high service standards ensure that tests meet bankable standards, accountability, quality assurance and transparency requirements. SGS allows companies start with scoping studies and shift to fully bankable studies seamlessly for any mineral extraction process. At the conclusion of a scoping study, it will be clear which steps and budget will be required to conduct prefeasibility and bankable feasibility studies.



CONTACT INFORMATION

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