

Exploration and Mining

Chemical methods for mineralogical phase analysis



When the mineralogical composition of the ore is complex and the commodity element exists in different mineralogical phases, it is extremely important to know the grades of the element in these different phases. This can be carried out by leaching samples with phase (or mineral) selective leaching agent and instrumental analysis of elements.

The leaching tests can be done using individual phase selective leaches or so called sequential or diagnostic leaches. These methods can be applied both to characterisation of new ores and to problem solving for ores, where metallurgical problems are faced. If the methods are selected adequately, they will give direct information of metallurgical characteristics of the ores. Together with data from the mineralogy, leaching tests can be useful to specify the leaching and assaying methods to be applied both to exploration/grade control drilling and the subsequent metallurgical test program.

Particularly in defining the reserves of disseminated low grade Ni-ores it is more meaningful to use recoverable (sulphidic) than total nickel (including silicate -Ni) already in the exploration stage. This gives a better basis for economic analysis and metallurgical design of the ore processing. This assay can be done using unique sulphide selective leach like ammonium citrate - hydrogen peroxide leach.

Sometimes the oxidation of mined sulphide ore affects the separation of the sulphide minerals during e.g. flotation process. The need for different processing conditions is caused either by the increased oxidized sulphide mineral surfaces and consequent changes in the flotation properties or by generation of soluble oxidation products. Also in this case the information of elements existing in different phases is crucial.

Your expert of analyses

Base metals

Mineralogical phase	Leach	Labtium method
Cu, Ni, Co in sulphides	Bromine - Methanol	250P
Cu, Ni, Co in sulphides	Ammonium Citrate - H ₂ O ₂	240P
Water soluble base metals (and SO ₄)	Water	206P
Base metals in carbonates (+water soluble base metals)	Acetic acid	241P
Cu, Ni in oxides	Sulphuric acid - Sodium sulphite	531P

Differentiation of free and refractory gold

Mineralogical phase	Leach	Labtium method
Free metallic gold	Cyanide leach	236A
Total refractory gold	Cyanide leach tailing – Fire Assay	704A/P

Diagnostic leach for gold

Diagnostic leaching procedure for gold involves selective destruction of minerals by acid leach and analysis of liberated gold by cyanide leach in this specified mineral phase. The acid treatment is done sequentially with increasing oxidative power to study the ratio of gold associated with different mineral phases in a given ore.

Chemical speciation methods

- Speciation of carbonate/non-carbonate carbon
- Speciation of sulphidic/ sulphate sulphur
- Speciation of Fe⁺² and Fe⁺³ (FeO/Fe₂O₃)
- Speciation of arsenite/arsenate

Labtium can develop also other speciation and diagnostic leaches tailored to client requirements.