

BUREAU VERITAS MINERALOGY AND PETROGRAPHY

AUTOMATED MINERALOGY BY QEMSCAN
AND MLA FOR THE MINING INDUSTRY

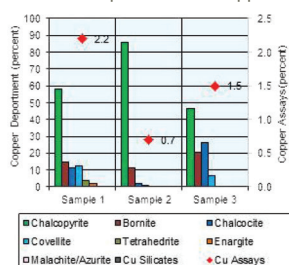


**BUREAU
VERITAS**

MINERALOGICAL STUDIES ARE CRITICAL TO SUCCESSFUL GEOLOGICAL EXPLORATION AND THE PROCESSING OF ORES

We offer a full range of packages including: bulk mineralogical analysis (BMA), particle mineralogical analysis (PMA), trace mineral search (TMS), FieldScan (FS) using QEMSCAN, MLA Express and optical mineralogy for both thin and polished sections.

Element Department for Copper

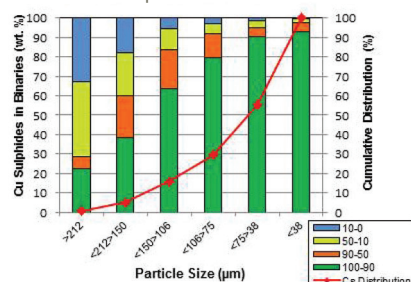


BULK MINERAL ANALYSIS (BMA)

A two-dimensional mapping analysis that provides in-depth data for investigative purposes such as the flotation or leaching process.

- Complete mineral composition and department
- Element department
- Mineral association
- Mineral liberation
- Mineral grain size

The Composition of the Copper Sulphide Binaries

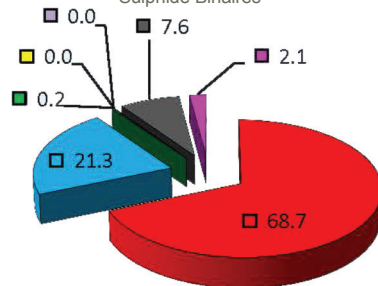


PARTICLE MINERAL ANALYSIS (PMA)

A two-dimensional mapping analysis that provides in-depth data for investigative purposes such as the flotation or leaching process.

- Complete mineral composition
- Elemental department
- Mineral liberation and associations by size
- Effect of primary grind on mineral liberation
- Limiting grade recovery curves for the elements of interest

The Composition of the Copper Sulphide Binaries



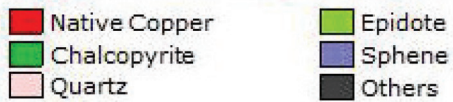
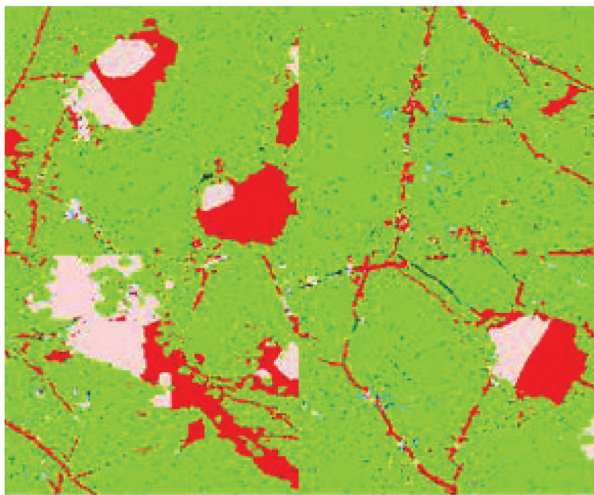
TRACE MINERAL SEARCH (TMS)

TMS is a refinement of the PMA scan but only measures a sub-population of the particles based on a backscattered electron intensity threshold value.

- Target mineral (gold/silver/PGM) grain size
- Target elemental distribution across bearing minerals
- Mineral grain size distribution
- Mineral liberation and association
- Mineral locking characteristics
- Mineral liberation by free surface



QEMSCAN Field Scan Mapping Image

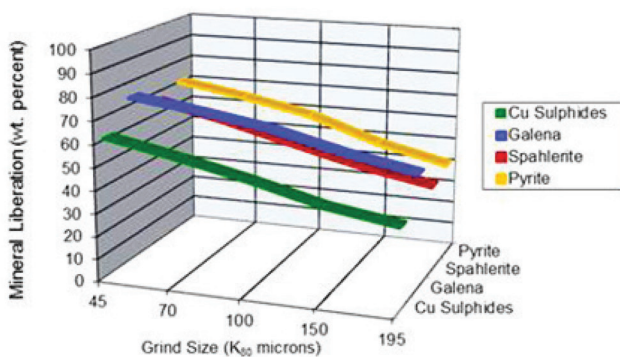


DIAGNOSIS OF METALLURGICAL PERFORMANCES

Using the combined methods of QEMSCAN/MLA analysis, to determine the sources that caused contaminations in the final concentrates and the losses of target metals into the tailings in plant operations or metallurgical tests.

- Efficiency of primary grind and regrinding on the target mineral liberations
- The quality of final concentrates
- Status of the target minerals lost into the tailings
- Target mineral recovery by process streams, by mineral association class and by particle size
- Evaluation of potential improvement in the concentrate quality

Effect of Primary Grind on Mineral Liberation





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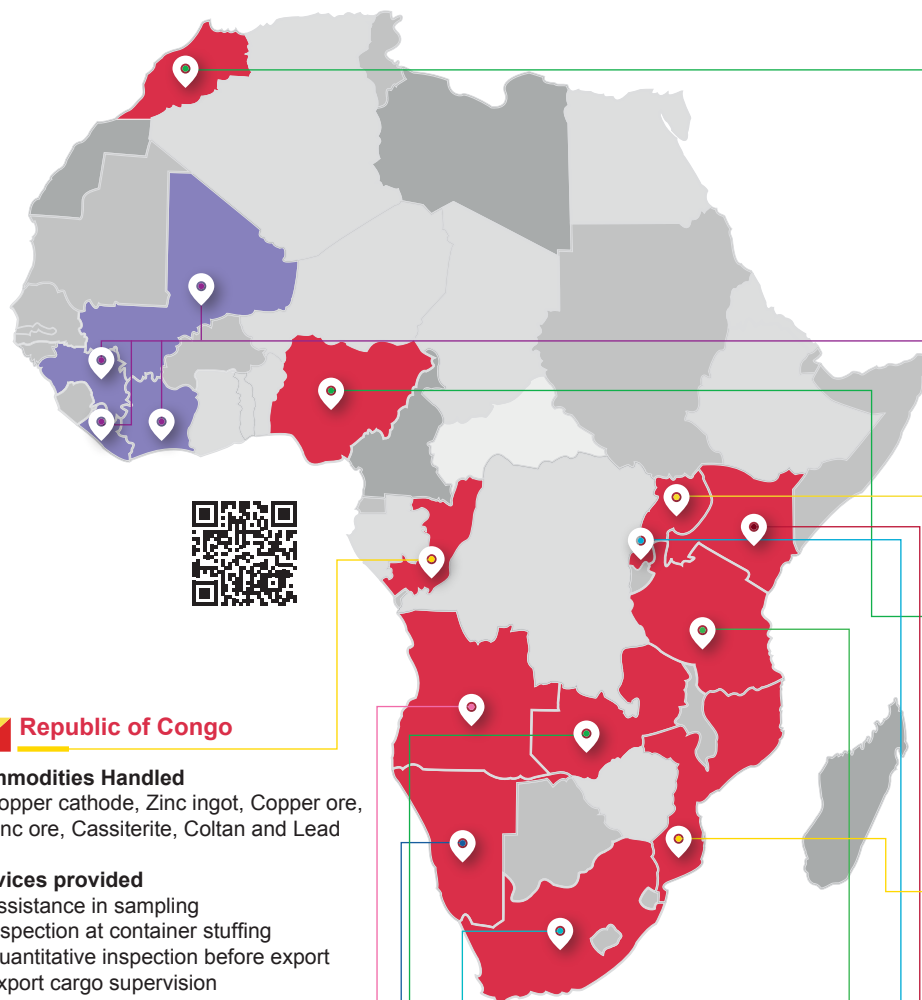
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BUREAU VERITAS MINERAL CAPABILITIES AFRICA



Republic of Congo

Commodities Handled

- | Copper cathode, Zinc ingot, Copper ore, Zinc ore, Cassiterite, Coltan and Lead

Services provided

- | Assistance in sampling
- | Inspection at container stuffing
- | Quantitative inspection before export
- | Export cargo supervision

Angola

Commodities Handled

- | Iron Ore

Services provided

- | Loading and weighing supervision

Namibia

Commodities Handled

- | Iron Ore, Copper Concentrate, Pyrite (gold) concentrate, Petcoke, Coal

Services provided

- | Supervision sampling and sample preparation

Zambia

Commodities Handled

- | Copper and Cobalt

Services provided

- | Sampling, preparation and analysis

South Africa

Commodities Handled

- | Copper Concentrate, Chrome Concentrate, Coal, Gold Concentrate, Pig Iron, Manganese Ore, Fluorspar, Andalusite, Bentonite, Chloride slag, Sulfate slag, Rutile, Ilmenite, Zircon, Pig Iron, Fluorspar, Iron ore, Water, Metallurgical Coke; Anthracite, Heavy Mineral Sand, Graphite, Chrome Concentrate, Platinum

Services provided

- | Loading and weighing supervision, sampling, preparation, various physical testing, analytical testing

Zambia

Commodities Handled

- | Copper, nickel, cobalt, coal, zinc, lead

Services provided

- | Sampling, inspections, analysis

Morocco

Commodities Handled

- | Rock, minerals and Water
- | Fertilisers and Gypsum

Services provided

- | Visual inspection, tally and draft survey, sampling and sample preparation

ECOWAS

Ivory Coast, Guinea, Mali, Liberia

Commodities Handled

- | Gold, Iron Ore and Aluminium

Services provided

- | Sample preparation
- | Sample analysis
- | Shipping to other labs

Nigeria

Commodities Handled

- | Lead, Zinc, Copper, Lithium, Zircon Sand, Manganese, Tin

Services provided

- | Physical sampling, weighing, stuffing supervision and sample prep/moisture determination

Mozambique

Commodities Handled

- | Coal, Iron Ore - Under Setup, Coal, Water and Oil Lab

Services provided

- | Stock pile sampling, vessel sampling, truck sampling, train sampling, mechanical sampling and sample preparation

Kenya

Commodities Handled

- | Cassiterite, Copper Ore, Tin Ore, Manganese Ore

Services provided

- | Weight verification and stuffing survey

Rwanda

Commodities Handled

- | Tin Ore, Tungsten, Niobium-Tantalum, Gold, Tin, Tungsten, Coltan, and Gemstones

Services provided

- | Loading supervision

Uganda

Commodities Handled

- | Copper Ore, Tin Ore, Zinc Ore, Lead Ore, Nickel Ore

Services provided

- | Weight Verification and Stuffing Survey
- | Preliminary Pre-Exploration Field Survey





**BUREAU
VERITAS**

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Shaping a World of Trust