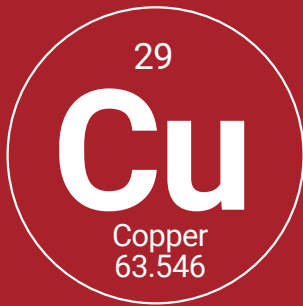


Quick Guide to Sequential Leach for Copper Ores



MSALABS offers sequential leach packages to determine the approximate constituents of copper ore.



Sequential Copper Leach packages are very useful tools for revealing the mix between Oxides, secondary Sulphides and relatively insoluble Sulphides.

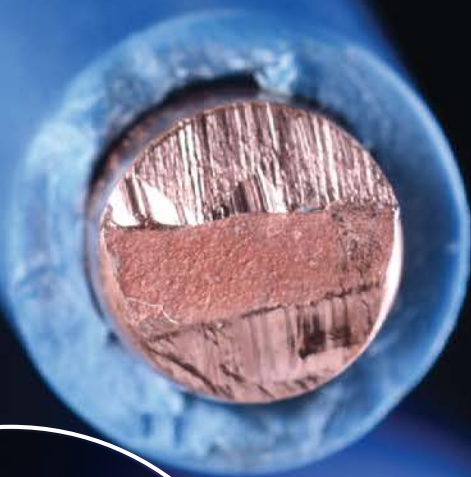
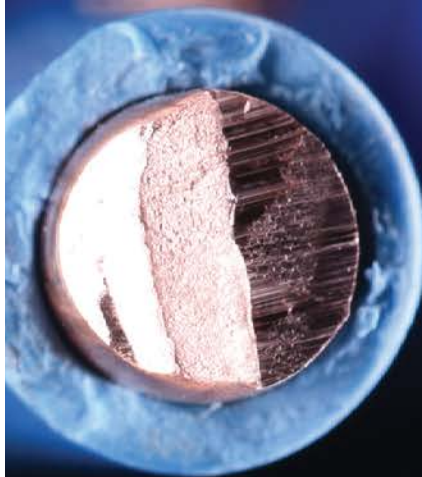
In combination with Mineralogical data, sequential leaches can reveal time saving information about the deposit. This can save money as one progresses in an exploration program.

Information garnered from the sequential leach process will enable a better understanding of the metallurgical processes required to successfully extract copper from the ore.



Typical minerals extracted by each stage of the sequential leach are shown in Table 1. In general, Sulphuric acid (H_2SO_4) is the first leach, followed by a Cyanide leach (eg NaCN). The residue is subsequently assayed by total digestion with Atomic Absorption finish.

In summary, the Sulphuric acid attacks copper oxide species, the Cyanide attacks secondary sulphides and Bornite minerals; while the total digestion attacks the relatively insoluble sulphide ores and chalcopyrite minerals. Information garnered from this process will enable a better understanding of the metallurgical processes required to successfully extract copper from the ore. A citric acid ($C_6H_8O_7$) digest will attack oxide and non sulphide copper minerals. It is a weaker acid than H_2SO_4 .



29
Cu
Copper
63.546

**TABLE 1:
APPROXIMATE PERCENTAGE DISSOLUTION OF COPPER MINERALS IN SULPHURIC ACID AND SODIUM CYANIDE SOLUTION**

Mineral	Approximate composition	% Dissolution in H ₂ SO ₄ *	% Dissolution in NaCN*
OXIDES			
Atacamite	Cu ₂ Cl(OH) ₃	100	100
Azurite	2CuCO ₃ ·Cu(OH) ₂	100	100
Cuprite	Cu ₂ O	70	100
Chrysocolla	CuSiO ₃ ·2(H ₂ O)	100	45
Malachite	CuCO ₃ ·Cu(OH) ₂	100	100
Native Copper	Cu	5	100
Tenorite	CuO	100	100
SECONDARY SULPHIDES			
Chalcocite	Cu ₂ S	3	100
Covellite	CuS	5	100
PRIMARY SULPHIDES			
Bornite	Cu ₅ FeS ₄	2	100
Chalcopyrite	CuFeS ₂	2	7

Notes: ^ Citric acid leach is also available

* Approximate dissolution after 1 hour of leaching pulverized material

With thanks to the SME for the use of this table

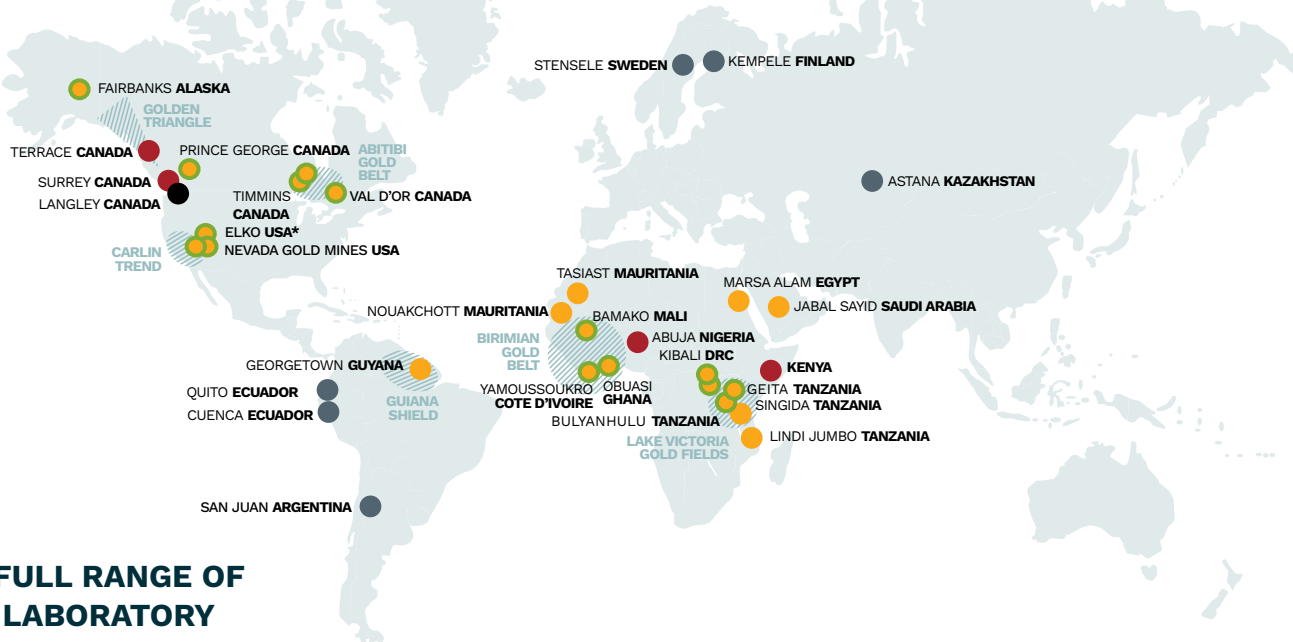
METHOD CODES AND DESCRIPTIONS

Cu by citric acid leach	SQL-CA1
Cu by sulfuric acid leach	SQL-AS1
Cu by sulfuric acid leach/sodium sulfite leach	SQL-AS2
Cu residue by 4-acid, ICP-ES finish	SQL-RE1
Cu residue by calculation	SQL-RE2
Total Cu by 4-acid, icp ES finish	ICF-6Cu
Sequential leach package	SQL-PK1



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- * Under Development

Note: Current at February 25



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* Copper assay only available in select locations and is not currently available in Canada

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