GEOLOGY 409

Assignment IV

C. Sibbald

MINERALOGICAL REPORT ON CRAIGMONT "A" ZONE COPPER ORE

OBJECT

The object of this report is to study the mineralogy and nature of the Craigmont "A" zone copper ore and to try to conclude what effect the ore characteristics will have on mineral dressing.

INTRODUCTION

The Craigmont property consists of 157 claims, located from December 1954 to 1957. The showings are on the Promontory Hills, 10 miles N.W. of Merritt at about 4000 feet elevation. Canadian Exploration Ltd. optioned the property in November 1957, and responsibility passed on to Canadian Exploration's newly formed subsidiary, Birkett Creek Mine Operators Ltd., in July 1958.

The area is devoid of outcrops and was discovered as the result of drilling an area of coincident geophysical and geochemical anomolies.

The property is on the boundary of dioritic phases of the Guichon Batholith and banded flows and tuffs of the Nicola volcanics. Intense alteration of the original minerals to chlorite, epidote and orthoclase is common. The mineralization is

is along a shear zone which strikes N.80°E. and dips steeply south in the upper portions.

Mineralization consists of large scale replacement, chiefly of the volcanic rocks by magnetite, specular hematite, or both, with included blobs and irregular vienlets of chalcopyrite. Bornite and pyrite are rare. Heavily replaced minerals consist of about 50% iron and 1% to 4% copper.

Mineralization is continuous for a length of 1750 feet across widths up to 200 feet. Its full extent both laterally and in depth is not yet determined. Probable ore reserves of 13 to 14 million tons grading about 1.8% copper and 17% iron were estimated in November 1958.

MEGASCOPIC EXAMINATION

Weak

The material studied consisted of specimens picked from two, one-thousand pound shipments of ore received at the University of British Columbia from Birkett Creek Mine Operators Ltd. The nature of the ore in the second shipment differed considerably from that of the first shipment.

Which is this? The ore consists of broken magnetite, with included blobs and disseminated grains of chalcopyrite. Hematite occurs as highly deformed lamellae (specularite) and is rare in this zone.

..... 3

Shipment No. 1

Estimated amounts of metallic minerals present are as listed below.

Mineral	Percent (Volume)
Chalcopyrite	8%
Magnetite	92%
Hematite	trace

- - - - - - - - - - -

The predominant gangue mineral in this shipment is calcite. The calcite appears to have a concentrating effect on chalcopyrite as chalcopyrite in contact with inclusions of calcite is in the form of blobs, whereas it is disseminated throughout the remainder of the ore. Chalcopyrite, particularly as inclusions in gangue, ranges down to minus 10 microns. A very small amount of the chalcopyrite occurs as grains this size.

The chalcopyrite is slightly oxidized in a few random locations, the oxidation occurring as a thin tarnish on the surface.

The polished specimens tend to favour the occurence of chalcopyrite.

Estimated Amounts of Chalcopyrite

	Percent Chalcopyrite
Polished specimen No. 1	40%
Polished specimen No. 2	25%
Overall estimate	8%

- - - - - - - - - - -

Shipment No. 2

The estimated amounts of metallic minerals are as listed below.

Mineral	Percent (Volume)
Chalcopyrite	85%
Magnetite	15%
Hematite	trace

- - - - - - - - - -

Gangue minerals are in far greater abundance in this shipment than in shipment No. 1 and consist of actinolite, calcite, chlorite, feldspar, and minor amounts of others.

A large portion of the chalcopyrite is massive although a few inclusions in gangue are less than 10 microns in diameter.

As in shipment No. 1 the magnetite is broken, the fractures being filled with chalcopyrite and gangue.

The polished section is representative of the specimens.

MICROSCOPIC

The minerals present and the features of importance in their identification and origin are as listed below.

(1) Magnetite: Dull grey, hardness F or G, isotropic, and magnetic. The magnetite is highly fractured and broken, the fractures being filled with chalcopyrite and gangue. See Figures 1 and 2.

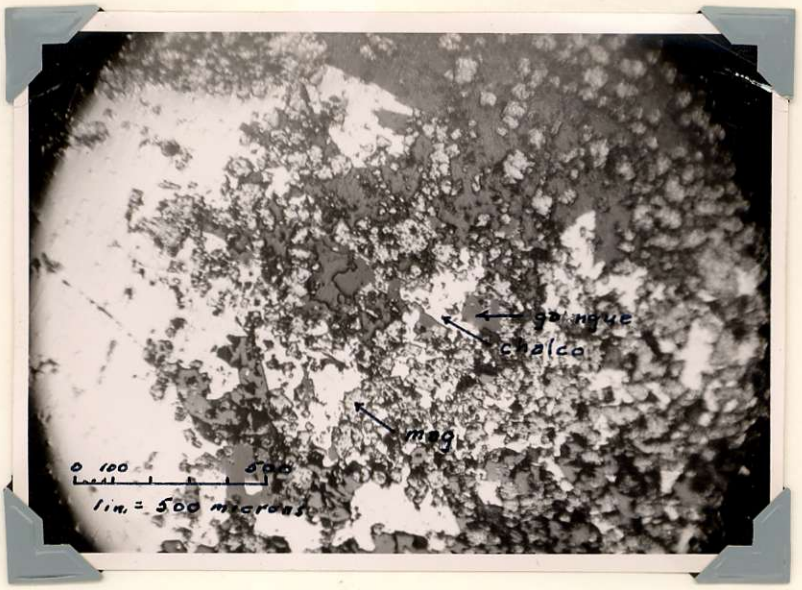


Figure 1

Broken magnetite surrounded by chalcopyrite and gangue.

Figure 2

Chalcopyrite veining magnetite.

(2) Hematite: Dull grey-white, hardness F or G, possibly anisotropic, lamellar texture (specularite)

(3) Chalcopyrite: Yellow, hardness C or D, isotropic. Observed veining magnetite, see Figure 2, and between lamellae of hematite. Chalcopyrite is later than either of the two iron minerals.

The fact that the magnetite is badly broken indicates that it crystallized from the fluid before movement had ceased, chalcopyrite and gangue which had not yet crystallized then filled the fractures.

A very minor amount of chalcopyrite occurs as minute inclusions (approximately 2 microns). These very small inclusions of chalcopyrite occur for the most part in gangue, see Figures 3 and 4.

Figure 3

Chalcopyrite inclusions in gangue.

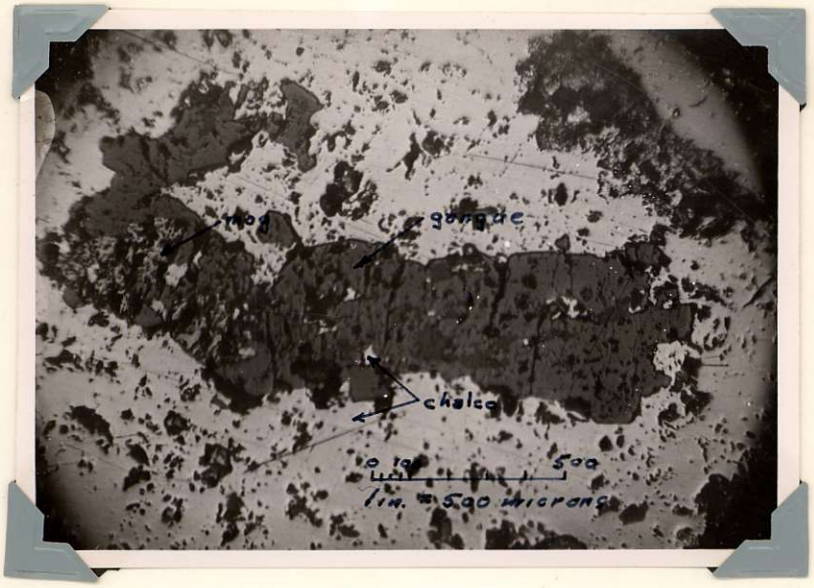


Figure 4

Gangue in chalcopyrite with chalcopyrite inclusions in gangue.

Order of Abundance of Primary Minerals

Shipment No. 1

Mineral	Percent (Volume)
Magnetite	68%
Chalcopyrite	32%
Hematite	trace

- - - - - - - - - - -

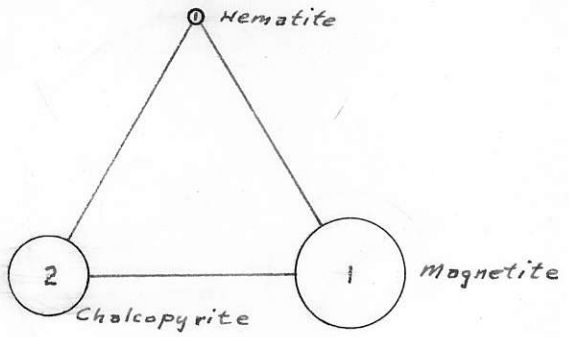
Shipment No. 2

Mineral	Percent (Volume)
Chalcopyrite	85%
Magnetite	15%
Hematite	trace

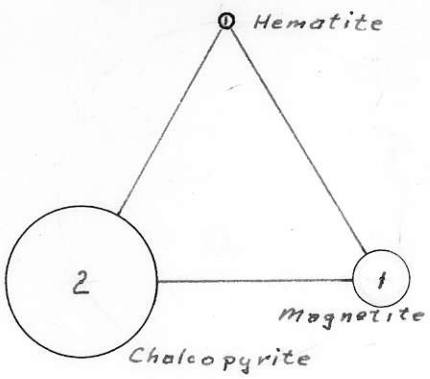
..... 8

Paragenetic Sequence

Shipment No. 1



Shipment No. 2



- - - - - - - - - - -

Temperature Type of Deposit

The deposit is of the Xenothermal type (high temperature, near surface). Evidence for this ?

PETROLOGY

Minerals identified and features of importance in their identification are as listed below.

(1) Epidote
- pleochroic
- yellow
- high relief
- 3%
- high birefringence
- euhedral grains

(2) Amphibole (Actinolite)
- fibrous
- $Z \wedge C = 12$
- 70%
- two cleavages at approximately 60° and 120°

(2) Amphibole (continued)
- strongly pleochroic
- colourless and green (dark N-S)
- biaxial negative
- 2 V large
- moderately positive relief
- high birefringence.

(3) Chalcopyrite
- opague
- yellowish in reflected light
- 1%

(4) Magnetite
- opague
- bluish in reflected light
- 1%

(5) Apatite
- moderative positive relief
- low birefringence
- parallel extinction
- colourless
- 1%

(6) Carbonaceous Material (Calcite etc.)
- 10%
- colourless
- high positive relief
- high birefringence

(7) Chlorite
- 10%
- low positive relief
- low birefringence
- pale green
- altering from actinolite

(8) Sphene
- 1%
- wedge shaped
- high positive relief
- high birefringence

..... 10

(9) Feldspar and/or Quartz

- 5%
- very fine grained

Textures

Pyrite is in a veinlet cutting the specimen. Also in veinlet is some carbonaceous material, probably calcite.

"Calcite" and fine grained quartz and/or feldspar occur together and appear to be an alteration product of the actinolite. Chlorite is replacing the actinolite.

Figures 5 and 6 are photographs of a thin section of actinolite. Figure 5 under one nicol and Figure 6 under crossed nicols.

Figure 5

Thin section of actinolitic rock showing fibrous interlocking nature of mineral.
1 nicol.

..... 11

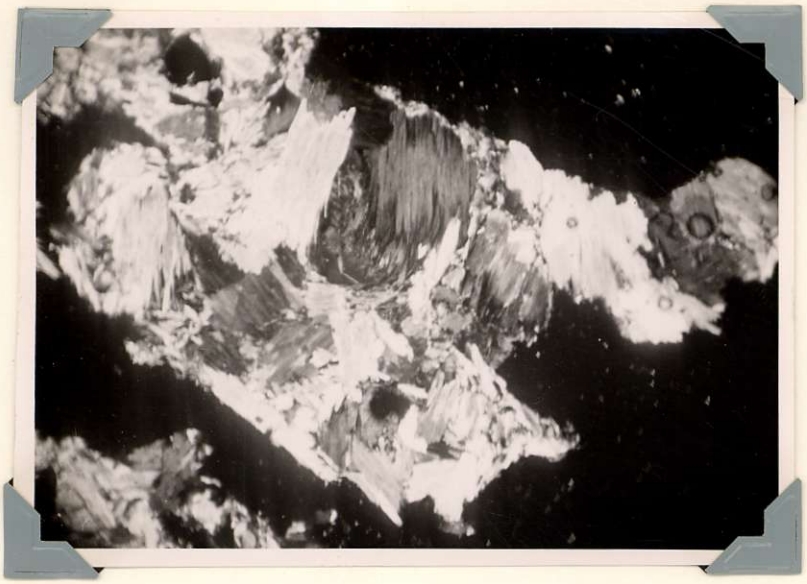


Figure 6

Thin section of actinolitic rock showing fibrous interlocking nature of mineral. Crossed nicols.

APPLICATION TO MINERAL DRESSING

As the mineralogy of the ore is quite simple, little difficulty should be encountered in recovering the chalcopyrite. Coarse grinding, (50-55% - 200 mesh), followed by flotation should produce satisfactory copper recovery.

The gangue is fairly tough and both hematite and magnetite are quite hard hence crushing and grinding will be moderately difficult.

The minor amount of oxidation observed should not have too deleterious an effect on flotation results.

..... 12

If a high grade copper concentrate is required, regrinding and cleaner flotation would be appropriate.

Giving consideration to the possible recovery of the iron it must be realized that the copper content of an acceptable iron concentrate is in the order of 0.03%. Possibly, finer grinding than previously stated would be necessary to produce an iron concentrate whose copper content would be within the maximum allowed.

* * * * * * * * *

References: Minister of Mines Report 1957 and 1958
D. Drummond, Petrology
Dr. Thomson, Photography