A MINERALOGRAPHIC INVESTIGATION OF A SUITE OF SPECIMENS FROM THE "RIM" DEPOSIT, NEAR THE HEAD OF CRUIKSHANK RIVER, VANCOUVER ISLAND, B. C.

A report submitted in partial fulfillment of the course requirements of Geology 409, a mineralography course at the University of British Columbia.

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Introduction

The suite of specimens described was supplied by Falconbridge Nickel Mines Ltd., Vancouver, B. C., from their Rim Deposit near the headwaters of Cruikshank River, Vancouver Island, B. C. The Cruikshank River has its origins in the mountains between Buttle and Comox Lakes and flows southeast to Comox Lake. The general area is approximately twenty air miles west of Courtenay, B. C.

Two very different types of specimens were supplied. One a mineralized quartz and the other a mineralized carbonate. Unfortunately, the relationship between the two is not known and for the purpose of this report it is assumed that they are two separate vein materials. The lump specimens were numbered A-1 to A-5 and were accompanied by a list of approximate assay values. The assay values are tabulated below.

Specimen	Silver	Gold
A - 1		.3 - .7 oz
A - 2	20 - 70 oz	.2 - .3 oz
A - 3	10 - 30 oz	.1 - .3 oz
A - 4	6 oz	1.0 - 3.0 oz
A - 5	6 oz	1.0 - 4.0 oz

Mineralography

Megascopic

All specimens were observed under the binocular microscope and subjected to the usual hand methods of investigation. The following minerals were identified in each of the vein types.

Quartz Vein - (A-1, A-4, A-5)

Arsenopyrite - Generally massive but in places individual well formed crystals can be seen. Much of the massive material appears fractured. Arsenopyrite is the most abundant sulfide.

Pyrrhotite - Invariably massive.

Chalcopyrite - occurs as small blebs and aggregations in pyrrhotite and quartz.

Carbonate Vein - (A-2, A-3)

Carbonate - Probably Siderite. Makes up about 95% of the gangue material.

Quartz - Occurs as small crystals along what is thought to be a vein wall.

Marcasite - Fine grained and banded. The

orientation of the banding shows wide variations.

Galena - Generally coarse grained and in intimate association with marcasite.

Chalcopyrite - Occurs as small blebs throughout the specimens.

Sphalerite - Occurs both as small blebs and aggregates. Most commonly associated with the carbonate.

Microscopic

The following minerals were identified in the polished specimens either by standard etch and microchemical tests or by x-ray analysis.

Quartz Vein - (A-1, A-4, A-5)

Arsenopyrite - Almost all the arsenopyrite observed was highly fractured with quartz filling the small fissures (figures 2 & 3). Gold was not seen either in or associated with the arsenopyrite.

Pyrrhotite - Common in all specimens. Takes a poor polish but no evidence of fracturing could be seen. In places pyrrhotite appears to fill fractures in the arsenopyrite.

Chalcopyrite - Occurs somewhat irregularly in the specimens in intimate association with pyrrhotite. Chalcopyrite and pyrrhotite

show mutual ex-solution textures.

Chalcopyrite was often observed filling fractures in and possibly replacing arsenopyrite.(figures 2, 4 & 5)

Sphalerite - Occurs as small grains with chalcopyrite. Some evidence of ex-solution from chalcopyrite was seen.

Carbonate - Observed on only one occasion as a narrow vein cutting sphalerite and chalcopyrite (figure 4)

Gold - Free gold was observed on only two occasions. In both cases the gold was in chalcopyrite. Both grains were about 400 microns in length.

Carbonate Vein - (A-2, A-3)

Marcasite - Invariably fine grained and banded. The banding assumes several orientations within the same specimen. Small cubes seen indicate that the marcasite may be pseudomorphous after pyrite. Replaced by carbonate along the planes of banding. (figures 6 & 7)

Galena - Generally occurs as coarse grained aggregates but occasionally seen as narrow bands in the marcasite. Replacement textures are common. (figures 6,7,8,9,10,12) No inclusions were brought out by etching.

Chalcopyrite - Occurs with sphalerite often showing mutual ex-solution textures. With sphalerite and carbonate, chalcopyrite often replaces galena. (figures 6,7,8,10)

Sphalerite - With chalcopyrite, sphalerite occurs as small grains and aggregates throughout the carbonate and replacing galena. (figures 6, 8, 9, 10)

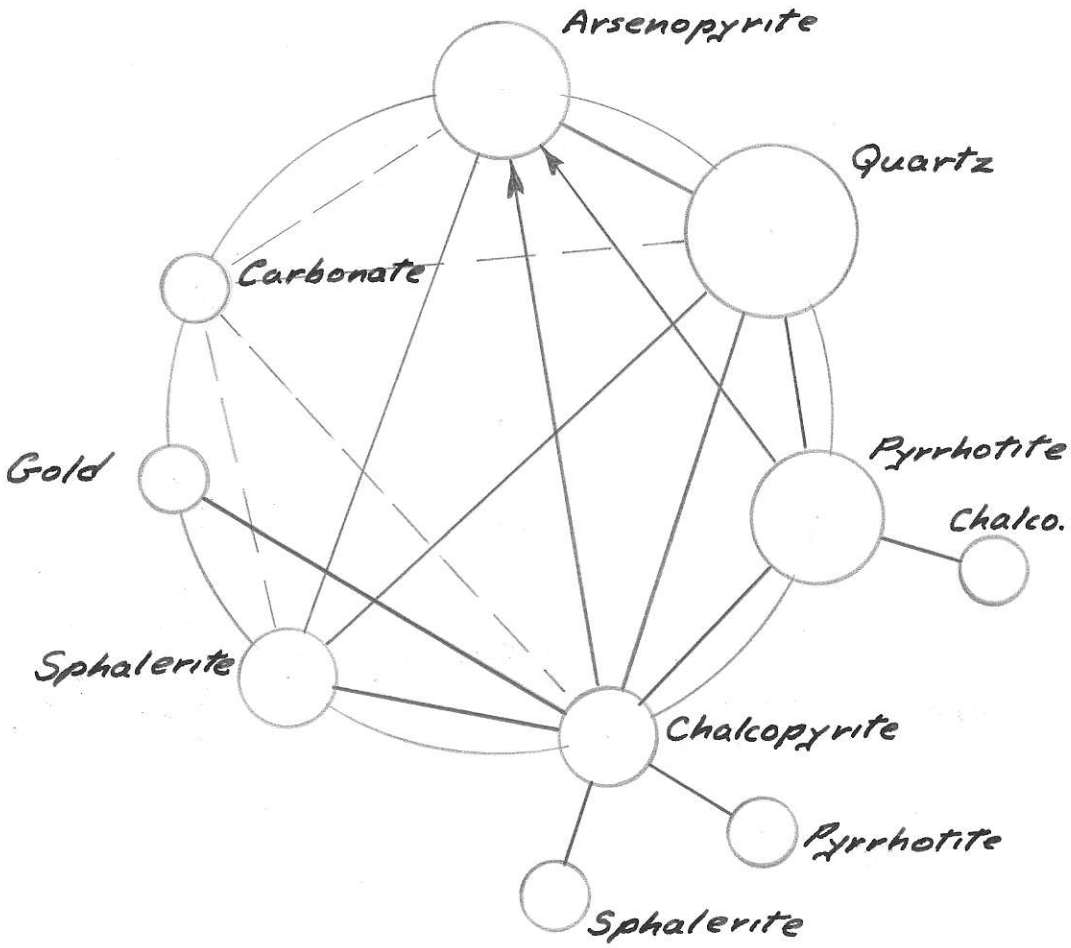
Tetrahedrite - Not a common mineral in the specimens observed but was seen on a few occasions with sphalerite and chalcopyrite. (figure 13). Sufficient quantities were not available for a microchemical test for silver but it is quite possible that this mineral is argentian tetrahedrite.

Boulangerite - This mineral was observed as fine blades in the carbonate gangue. (figure 14). X-ray analysis showed boulangerite and some weaker lines which might indicate the presence of other sulfosalts.

Carbonate - No analyses or thin sections were made but the carbonate appears to be predominately siderite.

Unknown -An undetermined mineral forms delicate lacework patterns in the carbonate particularly in the vicinity of galena replacement. This mineral may be goethite or a relict of the replacement.

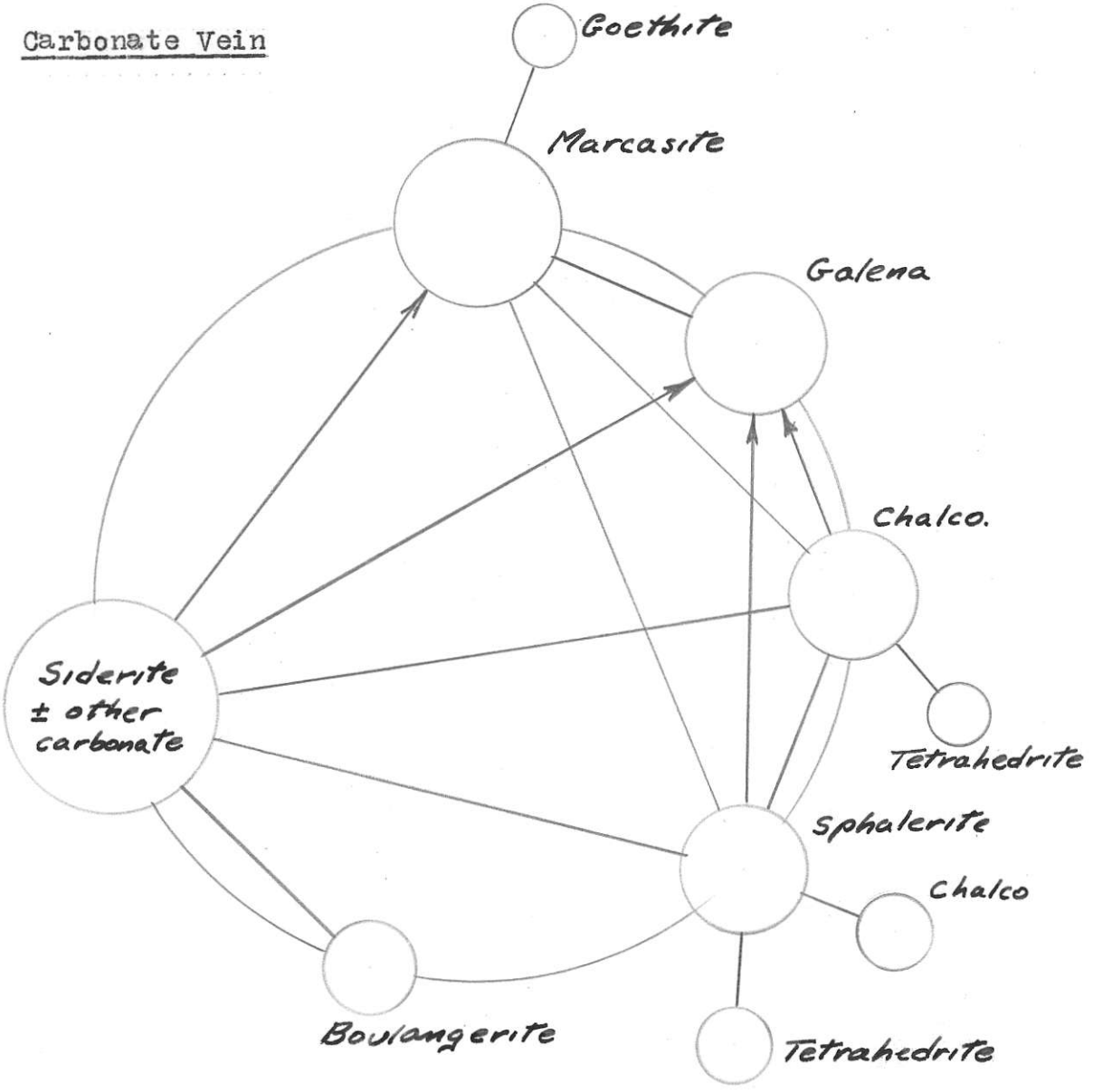
Quartz Vein



Relative abundance of ore minerals -

Arsenopyrite - 50%
Chalcopyrite - 15%
Pyrrhotite - 30%
Sphalerite - 5%
Gold

Carbonate Vein



Relative abundance of ore minerals

Marcasite - 50%
Galena - 30%
Chalcopyrite - 15%
Sphalerite - 5%
Tetrahedrite
Boulangerite

Paragenesis

Quartz Vein

The following sequence of events is indicated;

1/ Hydrothermal deposition of quartz and arsenopyrite. Movement during deposition caused fracturing of the arsenopyrite with more or less simultaneous healing of the fractures with quartz.

2/ A second phase of mineralization then occurred consisting of pyrrhotite, chalcopyrite and sphalerite. Gold is associated with this phase.

3/ A possible further stage of mineralization is indicated by the presence of carbonate. However, carbonate was observed on only one ocassion and it is not thought to constitute a major phase although the presence of carbonate does provide a link between the two vein types.

Carbonate Vein

The following sequence is postulated on the basis of microscopic and megascopic evidence.

1/ Deposition of pyrite or pyrrhotite and galena as a vein filling. Quartz may also have been present in this phase as small quartz crystals can be seen along what is thought to be a vein wall. However, quartz was not seen with any of the sulfides.

2/ A second phase of mineralization then occurred consisting of carbonate, chalcopyrite, sphalerite with minor quantities of tetrahedrite, boulangerite and possibly other sulfides or sulfosalts. This phase altered the pyrite or pyrrhotite to marcasite and replaces much of the galena. It is thought that the silver present is associated with this phase of mineralization.

Summary and Conclusions

Two very different vein types were represented by the specimens supplied although there is some evidence that might connect the two. One type is a quartz vein and the other a carbonate vein. Assays given indicate that the quartz vein carries high gold values while the carbonate vein carries high silver values.

Free gold was observed in only the quartz vein and then only on two occasions. Both grains were less than 400 microns in lenghth. In both cases the gold was intimately associated with chalcopyrite, a mineral thought to represent a second phase of mineralization.

No silver minerals were observed in the carbonate vein, but tetrahedrite, which may be argentian, was observed in small quantities with sphalerite and chalcopyrite. Tetrahedrite is thought to have accompanied a second phase of mineralization.

It is quite possible that other silver minerals may be present in the specimens. Unfortunately time was not available to make sufficient sections to ensure complete sampling. In addition, it is also possible that the specimens supplied are not truly representative of the material assayed.

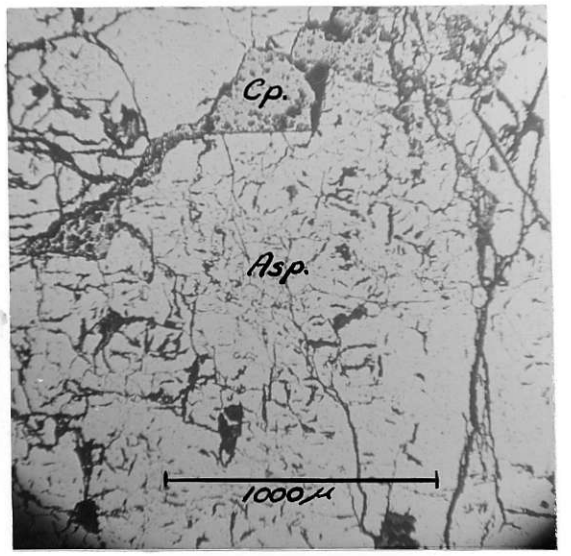


Figure 2

Shattered arsenopyrite.
Note chalcopyrite filling
the large fracture.

Cp - chalcopyrite
Asp - Arsenopyrite

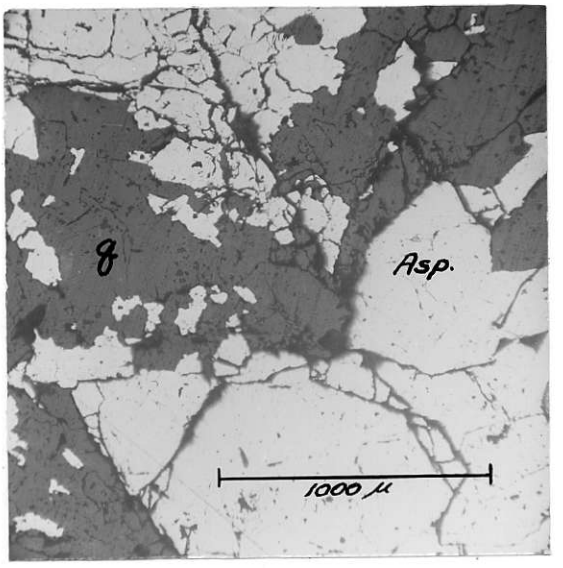


Figure 3

Arsenopyrite with quartz
filling fractures.

q - Quartz

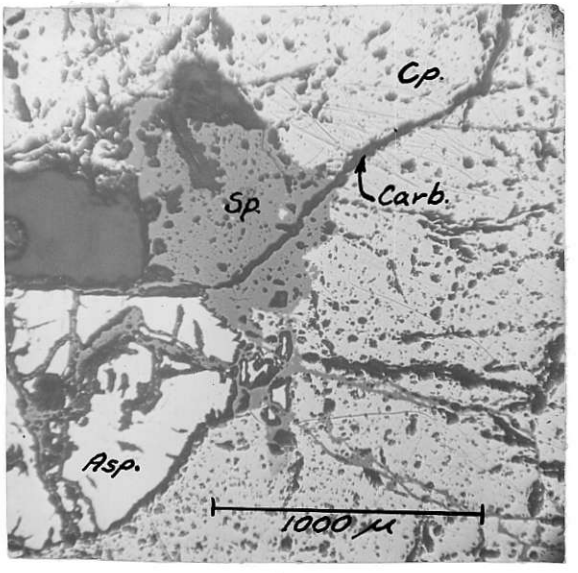


Figure 4

Carbonate veinlet cutting
chalcopyrite, sphalerite.
Carbonate does not cut the
arsenopyrite but runs along
the grain boundary between
the arsenopyrite and quartz.

Carb - Carbonate.

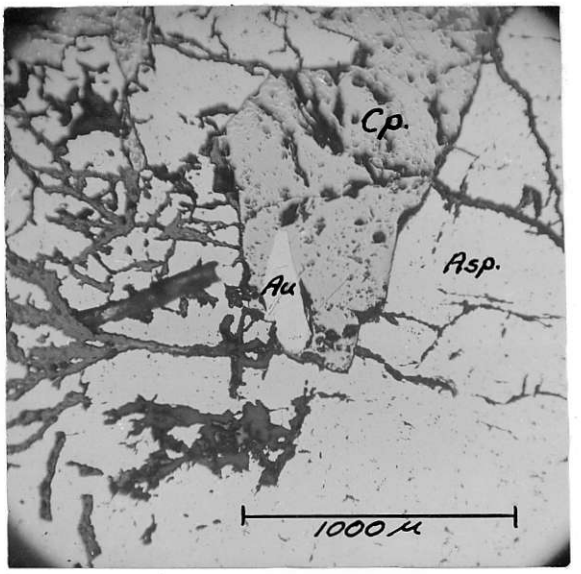


Figure 5

Gold with chalcopyrite

Au - gold

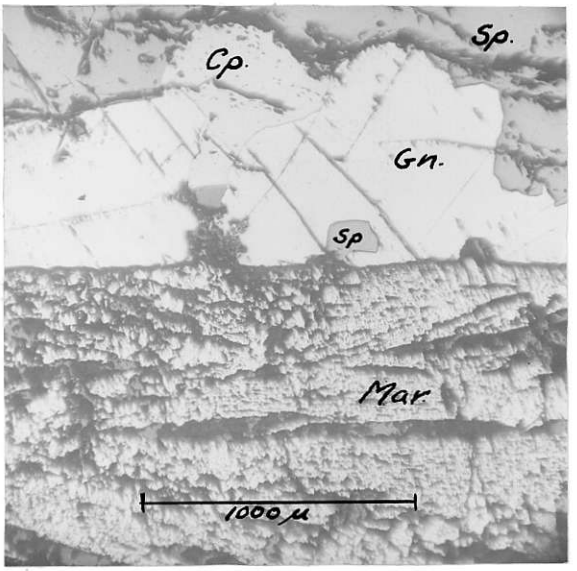


Figure 6

Marcasite contact with galena. Note replacement of galena by chalcopyrite and sphalerite

Mar - marcasite
Gn -galena

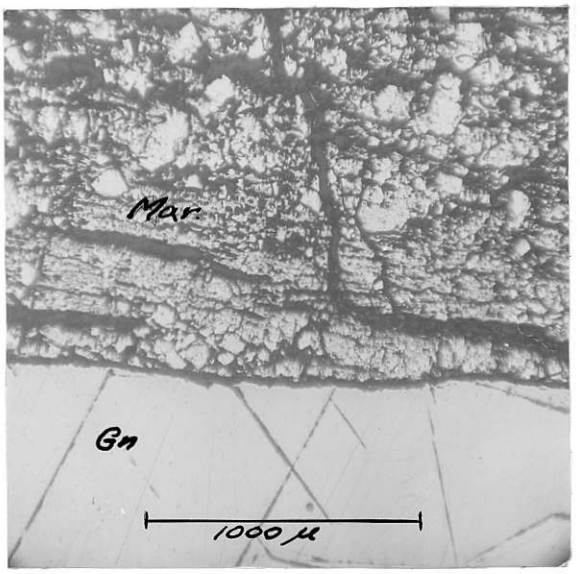


Figure 7

Contact of galena and marcasite. Dark bands in the marcasite are carbonate.

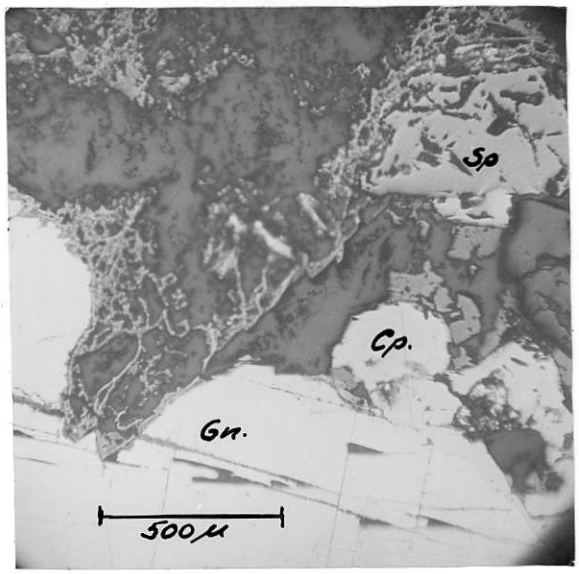


Figure 8

Carbonate replacing galena.

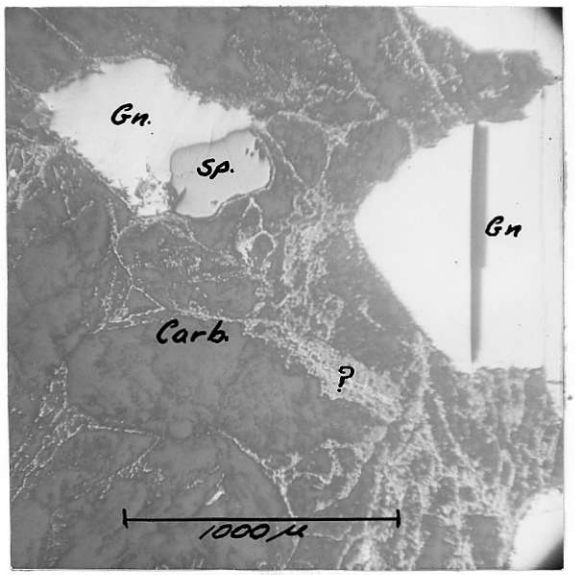


Figure 9

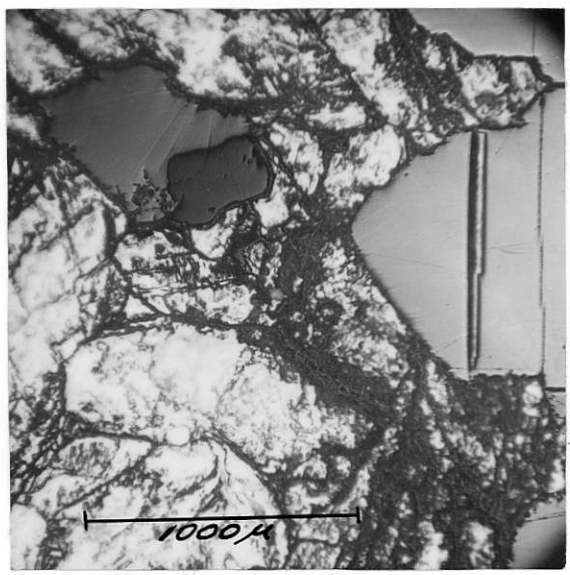


Figure 10
Crossed Nicols

Carbonate replacing galena. The mineral forming the lacework in the carbonate could not be determined with any certainty but may be Goethite.

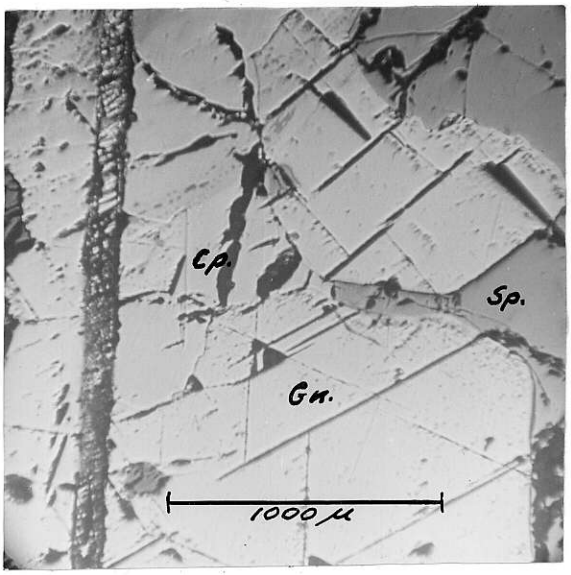


Figure 11

Chalcopyrite and sphalerite replacing galena.

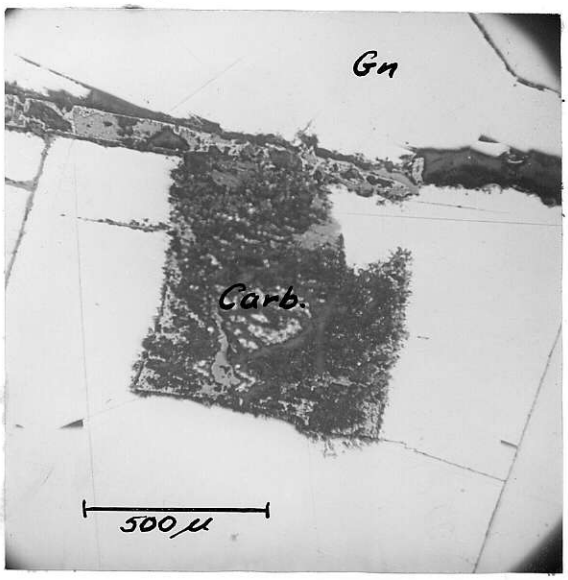


Figure 12

Carbonate replacing galena.

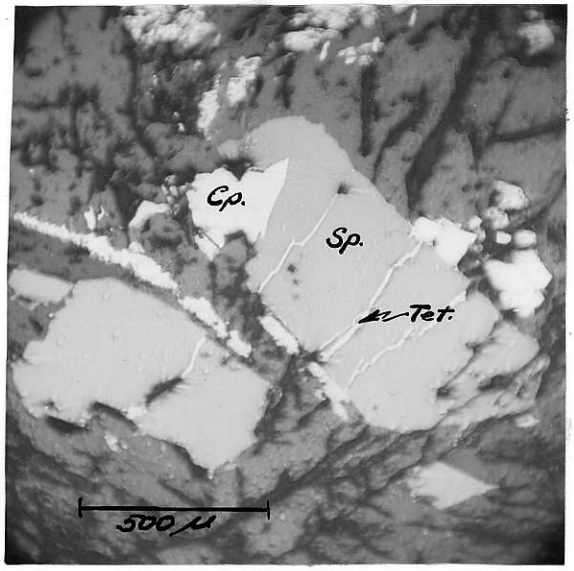


Figure 13

Tetrahedrite in sphalerite.

Tet - Tetrahedrite.

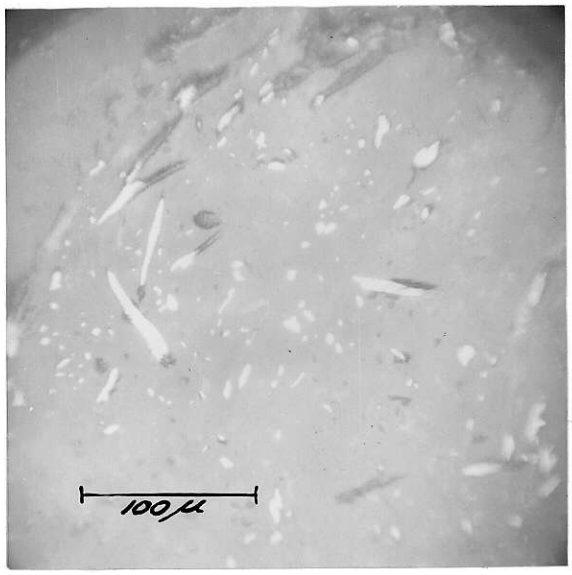


Figure 14

Boulangerite in carbonate.

FALCONBRIDGE NICKEL MINES LTD.
504 - 1112 WEST PENDER STREET PHONE 682-3868
VANCOUVER 1, B.C.

TO

FROM J. J. McDougall

PLACE

PLACE 504 - 1112 West Pender Street

DATE November 26, 1963.

3M-MP-863

#A Series -- "RIM" deposit, head of Cruickshank River, Vancouver Island.

1-3 -- Quartz -S2 veins in volcanic rx.

4-5 -- Quartz -S2 veins in granitic rx.

Approximate Assay Values

A1 -- 0.3 to 0.7 Au.

A2 -- 0.2 to 0.3 Au, 20-70 oz. Ag.

A3 -- 0.15 to 0.3 Au, 10-30 oz. Ag.

A4 -- 1.0 to 3.0 Au, 6 oz. Ag.

A5 -- 1.0 to 4.0 Au, 6 oz. Ag.

Main Problem:-

Where and how the gold - also the silver in A2.