A MICROSCOPIC STUDY OF MINERALIZATION OF THE HOMATHKO GOLD MINES.

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ABSTRACT

This report describes the microscopic examination of a suite of ore from the property of the Homathko Gold Mines, Limited. It is submitted in partial fulfilment of the course in Geology 409, Mineralography, at the University of British Columbia.

The minerals observed in the prepared sections were sphalerite, galena, arsenopyrite, pyrite, chalcopyrite, tetrahedrite, covellite, gold, quartz and calcite. The gold apparently occurs free, and as an erratic distribution.

INTRODUCTION

The Homathko property is located in the Chilcotin district of the Clinton Mining Division on the western side of the valley at the head of Wolverine Creek, a small tributary of the west branch of the Homathko River. Tatla Lake Post-office, 24 miles to the north-east, is the nearest settlement. The thirty mineral claims and fractions cover the steep, rocky, eastern slopes of Black Horn Mountain, which rises to 9,000 feet elevation.

The property may be reached by travelling first over the Chilcotin motor-road 150 miles westerly from Williams Lake; thence by rough road 15 miles in length, over which trucks are operated, to the northern end of Bluff Lake. A 17 mile pack trail extends from the latter point to the claims.

ACKNOWLEDGMENTS

The writer wishes to thank Dr. H.V. Warren and Dr. R.M. Thompson for supplying the suite of ore for study and for assistance in the work, and Mr. J. Donnan for cutting the specimens and instruction in polishing and mounting the sections.

GENERAL GEOLOGY OF THE AREA

The claims comprising the Homathko Gold property are largely underlain by thick flows of Tertiary andesite and basalt intercalated with bands of argillite and conglonerate. The strata are compressed into steeply dipping folds, the general strike of the formation being northerly. The irreg-ular eastern margin of the Coast Range batholith lies not far to the west and south-west, and a large area of granodiorite intrudes the Triassic greenstones on the south-western flank of Black Horn Mountain. In the vicinity of the showings there are several dykes ranging in composition from andesite porphyry to quartz porphyry, and varying in width from 2 to 20 feet.

The numerous quartz exposures occur, in general, in schistose rocks. The veins are generally less than 2 feet wide, and the majority of them are comparatively short lenses which are related to more persistant structural breaks. The metallic minerals in the veins are in the form of small amounts of sulphides, together with native gold.

GENERAL MINERALOGY

The sections examined are from three different veins, as follows:

Sections 1,2,3, - Black Horn vein

Sections 4,5,6, - Upper vein

Sections 7,8,9,10- Lower vein

Megascopic Examination:

An examination of the hand specimens showed the mineralization to have characteristics of both fissure filling and replacement. The minerals of the Black Horn vein are distributed as closely spaced narrow parallel veinlets in quartz, indicating fissure filling. The walls of the fissures are unmatched however, and therefore replacement of the quartz has also taken place. The minerals of the Upper and Lower veins appear to have been deposited in crushed quartz and wall-rock, and have replaced it to some extent both as larger irregular masses and as smaller disseminations.

Megascopically, the hand specimens revealed the presence of sphalerite, galena, pyrite, arsenopyrite, and chalcopyrite, with a gangue of quartz and calcite. The sulphides comprise from five to ten percent of the vein-rock by volume. Some altered fragments of wall-rock are included in the quartz of the Upper and Lower veins.

Microscopic Examination:

Black Horn Vein - The three sections prepared of this vein represent a series taken across mineralized bands of the vein and cut at right angles to the strike of the mineral veinlets.

The sulphides follow small fractures in quartz, and consist of sphalerite, arsenopyrite, galena, pyrite and chalcopyrite, in order of abundance. A small particle of native gold 30 microns in size was found in section #2. Calcite occurs as a filling of late fractures in the quartz.

Lower and Upper Veins - The mineralogy and general mineral relationships are similar for these two veins, the metallic minerals observed being sphalerite, galena, pyrite, chalcopyrite, tetrahedrite and covellite. Quartz and calcite compose the gangue, with calcite in greater relative amount than in the Black Horn vein. It is notable that arsenopyrite is absent in these veins although it is abundant in the Black Horn sections, and tetrahedrite and covellite are found in minor amounts representing other differences in mineralogy.

DETAILED MINERALOGY

Descriptions and Occurrence of the Minerals:

Sphalerite

Sphalerite occurs in all the sections prepared, in association with quartz which it replaces in part. It is generally in large amounts relative to the other metallic minerals present. Disseminations of chalcopyrite are frequently found throughout some of the larger masses of sphalerite, probably the result of exsolution. The sphalerite of the Black Horn vein contains considerably more iron than that of the Upper and Lower veins, as shown by microchemical tests.

Galena

Varying amounts of galena are found in the sections, ranging from the most abundant sulphide in some to small blebs in others. The characteristic triangular pits are clearly shown on its polished surface in several places. Galena appears to have been deposited slightly later than the sphalerite, which it replaces.

Arsenopyrite

Arsenopyrite is found only in the sections made of the Black Horn vein. It is mainly distributed in bands of crystalline networks. Perfect diamond shaped crystals are very common and apparently had ample time to form. Arsenopyrite, although deposited early in the mineralogical sequence, shows no evidence of replacement by succeeding minerals. It is quite fine grained, the average grain size being about 100 microns.

An assay of a band of arsenopyrite showed it to carry nil values in gold.

Pyrite

All three of the veins contain pyrite in small amounts, usually as the remnants of crystals which have been largely replaced by sphalerite. The pyrite is closely associated with quartz, and was an early mineral to form.

Two closely spaced periods of pyrite deposition appear to be present in the Black Horn vein. Section #3 shows the darker crystalline outlines of an earlier pyrite replaced by a somewhat lighter colored pyrite which possibly crystallized out of a solution of slightly different composition (Fig. 6). The largest grains of pyrite observed were 1500 microns in size.

Chalcopyrite

Small blebs of chalcopyrite are disseminated throughout much of the sphalerite. It also occurs as larger crystals however, around the rims of sphalerite crystals, and hence some of it probably crystallized at a slightly later period than the sphalerite. The only gold observed was found at the contact of a crystal of chalcopyrite with quartz.

Tetrahedrite

Tetrahedrite was observed only in sections of the Lower and Upper veins and in small amount except for section #7. It is found replacing quartz, sphalerite and pyrite, but would appear to be an earlier mineral than galena.

The tetrahedrite was tested microchemically for silver by the use of potassium mercuric thiocyanate solution. The bare trace of fine white precipitate that spread out before the greenish mass-like crystals of copper indicated a low silver content.

Covellite

A few very small crystals of covellite less than 25 microns in size occur along late fractures. The relationship is not easily apparent, but is probably a secondary mineral.

Gold

The only gold found was in section #2 from the Black Horn vein, where a small crystal 30 microns in size was observed at the contact of a grain of chalcopyrite with quartz. Much of the chalcopyrite in the sections is in small, dispersed crystals that are very yellowish in color and simulate the appearance of gold. Etch tests of these occurrences reveal their true nature.

Quartz

Quartz represents the main gangue mineral in the veins, and at least two periods of it are present. Early quartz, forming the main bulk of the vein, has been fractured allowing access of later silicious, mineralized solutions. This is shown by the presence of euhedral quartz crystals in galena. Comb structure of quartz may be observed in section #10 under inclined light.

Calcite

Calcite fills late fractures in the quartz and has also replaced it to some extent. It does not appear to be related to the mineralization.

Paragenesis:

Since the mineralogy of the Black Horn vein differs slightly from that of the Upper and Lower veins, its paragenesis will be considered separately.

Black Horn Vein

1. Fracturing of the country rock with the development of tension fractures and shear zones.
2. Deposition of quartz, pyrite and arsenopyrite, the metallic minerals crystallizing first and showing euhedral form.
3. Fracturing of the quartz and deposition of a silicious solution containing arsenopyrite along the fractures.
4. Deposition of sphalerite.
5. Deposition of chalcopyrite.
6. Deposition of galena.
7. Fracturing.
8. Carbonate solutions along fractures.

```
Quartz       -------------------
Arsenopyrite ---------------
Pyrite       -----------
Fracturing
Sphalerite                    ------------
Chalcopyrite                   -------------
Galena                             -------------
Fracturing
Calcite                                            -----
Gold                                                      ----


SiO2         -------------------
Fe           -----------------------------
As           ---------------
S            -----------------------------------
Zn                           -------------
Cu                            --------------
Pb                              ----------------
Ca                                                 -----
CO2                                                -----
Au                                                       ----
```

Upper and Lower Veins

1. Fracturing and brecciation of the country rock with the formation of shear zones.
2. Deposition of quartz.
3. Deposition of pyrite.
4. Fracturing
5. Deposition of sphalerite
6. Deposition of chalcopyrite
7. Deposition of tetrahedrite
8. Deposition of galena
9. Deposition of calcite
10. Deposition of secondary covellite.

```
Quartz       ---------------------------
Pyrite       --------------
Fracturing
Sphalerite                  ----------
Chalcopyrite                 -----------
Tetrahedrite                  ------------
Galena                         --------------
Fracturing
Calcite                                        -----
Covellite                                             ----
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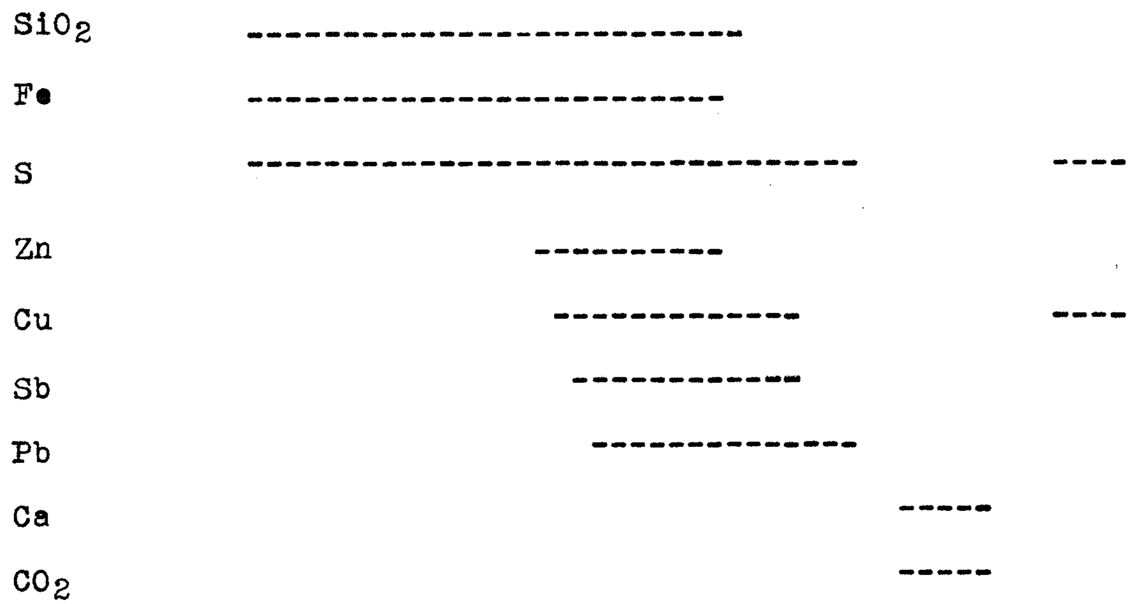

Assaying Results:

Assays taken of the mineralized quartz of the three veins, together with an assay of the banded arsenopyrite from the Black Horn vein, gave the following results:

	Oz.Au/ton
Black Horn vein	0.42
Banded arsenopyrite	nil
Upper vein	0.16
Lower vein	0.12

The above assays are probably not representative of the average grade of the veins as they only represent assays of small pieces of vein-quartz. Much better assays have been reported from the property.

CONCLUSIONS

The sections examined of the three veins exhibit a relatively simple mineralization and paragenesis. The vein-quartz has been fractured allowing access of mineralizing solutions and the replacement of the quartz.

The mineralization of the veins is of the mesothermal type, and a general overlap of much of the deposition is indicated.

The Black Horn vein shows differences in mineralogy and general appearance from the Upper and Lower veins, which are essentially similar.

The one occurrence of gold, found in the Black Horn vein, showed it to be in the free state. It would appear to have been deposited at a late stage and independant of the other minerals. An assay of the arsenopyrite from this vein showed nil values in gold. Little difficulty should be found in milling the ore, as the gold could either be amalgamated or readily cyanided.

BIBLIOGRAPHY

Report of Minister of Mines, British Columbia, 1938, Part F, pp. F.29-32.

LIST OF MINERAL OCCURRENCES OF INDIVIDUAL SECTIONS.

The minerals are listed in their order of abundance.

Section #1

- Galena
- Sphalerite
- Arsenopyrite
- Pyrite
- Chalcopyrite

Section #2

- Sphalerite
- Arsenopyrite
- Pyrite
- Chalcopyrite
- Galena
- Gold

Section #3

- Sphalerite
- Galena
- Arsenopyrite
- Pyrite
- Chalcopyrite

Section #4

- Sphalerite
- Galena
- Pyrite
- Chalcopyrite
- Tetrahedrite

Section #5

- Sphalerite
- Pyrite
- Chalcopyrite
- Galena

Section #6

- Sphalerite
- Galena
- Pyrite
- Chalcopyrite
- Tetrahedrite
- Covellite

Section #7

Sphalerite
Galena
Tetrahedrite
Pyrite
Chalcopyrite
Covellite

Section #8

Sphalerite
Galena
Pyrite
Chalcopyrite

Section #9

Galena
Sphalerite
Pyrite
Chalcopyrite

Section #10

Sphalerite
Galena
Pyrite
Chalcopyrite

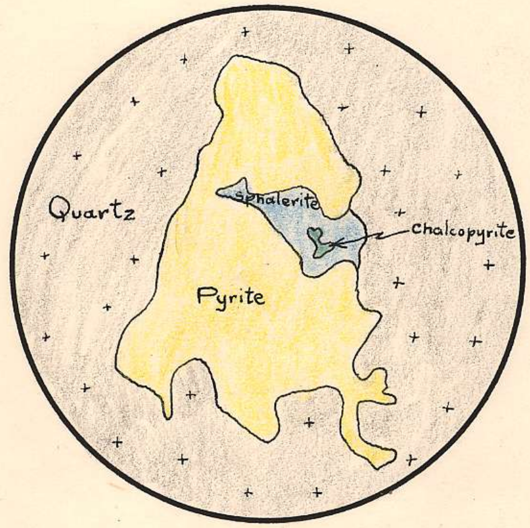

Fig. 1 - Sec. #2

Sphalerite replacing pyrite.

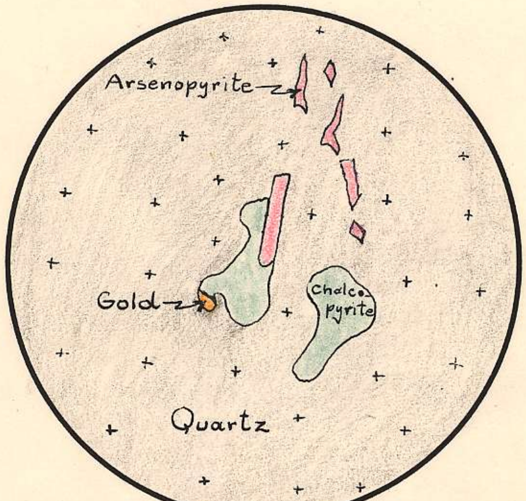

Fig. 2 - Sec. #2

Gold at contact between chalcopyrite and quartz.

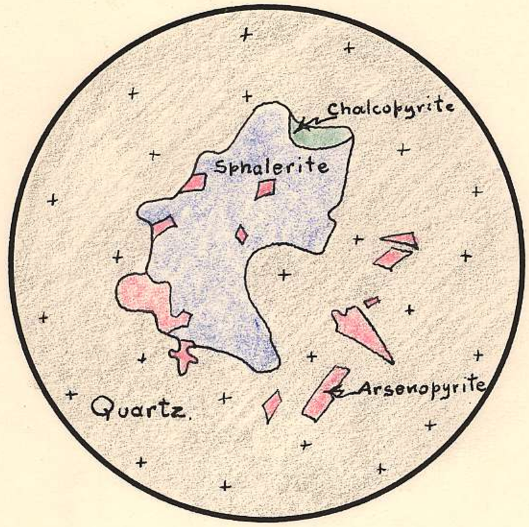

Fig. 3 - Sec. #2

Selective replacement of quartz by sphalerite leaving euhedral arsenopyrite crystals.

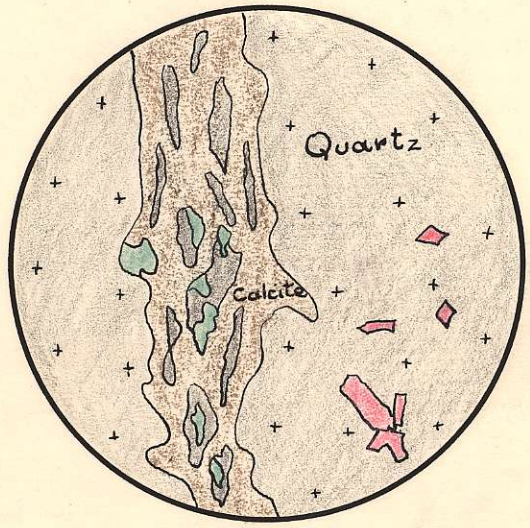

Fig. 4 - Sec. #2

Cȧlcite occupying fissure and replacing quartz.

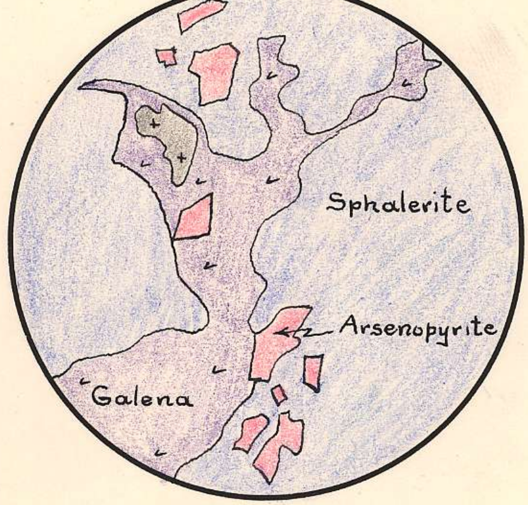

Fig. 5 - Sec. #3

Replacement of sphalerite by galena, euhedral arsenopyrite crystal remaining.

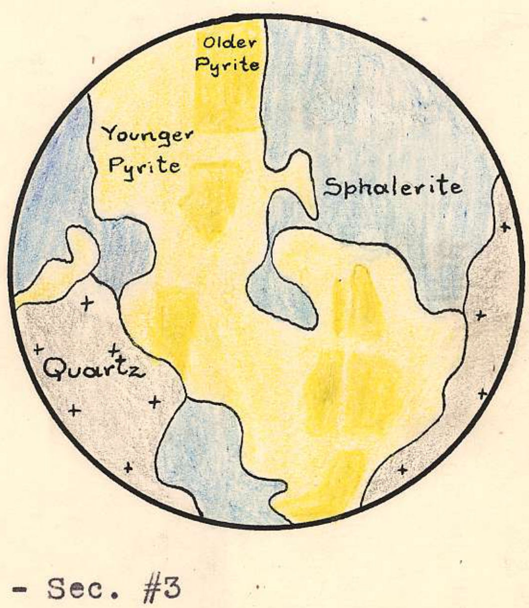

Fig. 6 - Sec. #3

Showing two periods of pyrite - darker crystalline outlines of older pyrite surrounded by lighter colored younger pyrite.

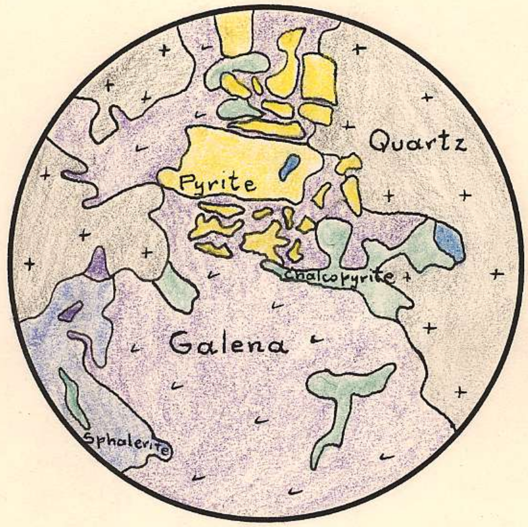

Fig. 7 - Sec. #6

Galena replacing pyrite and sphalerite.

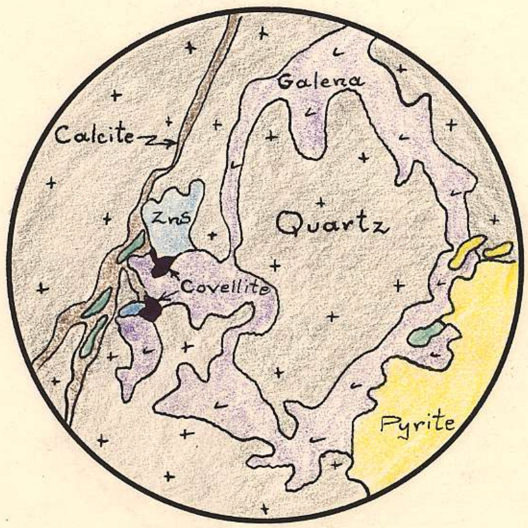

Fig. 8 - Sec. #6

Occurrence of secondary covellite along calcite filled fractures.

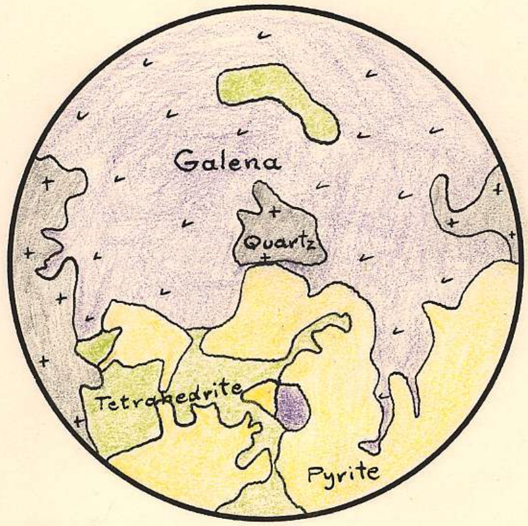

Fig. 9 - Sec. #7

Tetrahedrite replacing pyrite.

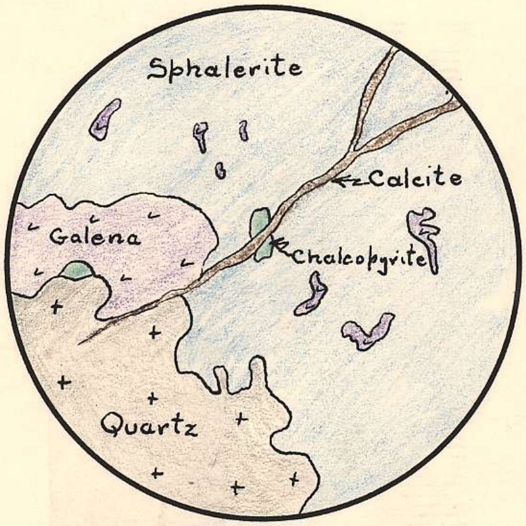

Fig. 10 - Sec. #10

Showing a late calcite filled fracture cutting a crystal of chalcopyrite.