Sloppy. No references.
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ORE MINERALOGY OF SWANNEL

OR

TAHTSA MINING COMPANY

A Report submitted during

the year s study in Geology 409

April 15, 1951

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TABLE OF CONTENTS

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ABSTRACT

The following report describes the minerals in samples from the Tahtsa Mining Co. property. From the samples given to the author for mineral determination, nine were picked for inspection under a microscope. These were sectioned and polished. All samples were inspected macroscopically. The minerals found in the two inspections, macroscopic and microscopic, are listed in their believed order of deposition with the means of their determination.

The pictures contained in the report are given to help the reader distinguish the association of the minerals and

so understand their paragenisis as the author believes they occurred.

Little information on the history of the property was found. However, a short summary is given on the surface geology.

INTRODUCTION

The samples given to the author for inspection are from Swannel, better known as the Tahtsa Mining Co. The collector was G.A.Dirom.

Swannel is a group of three claims formerly owned by George Seel, of Wistaria. These three claims are on the northern slopes of Swing Peek Mountain on the south side of Tahtsa river. Seel landing at the foot of Swing Peek mountain is 63 miles from Ootsa Lake Post-office, which is 40 miles by road from Burns Lake, the nearest railway station.

At elevation 4,930 feet there is exposed by open cuts and outcrops a shear zone replacement fissure in the enclosing porphyritic rocks. Where fully exposed the fissure width is 9 feet 6 inches. Mineralization is mainly confined to 10 inches on the footwall containing galena and sphalerite with lesser amounts of chalcopyrite and tetrahedrite. The fissure strikes 530° E (mag) with almost verticle dip to the south-west. The bedding planes strike

540° E (mag) and dip north-east. Small branch veins follow the bedding planes from the main fissure. This described zone is exposed 300 feet along the strike.

About 200 feet east of the described zone at lower elevation a shear zone outcrops showing galena and sphalerite. This shear strikes 515° (mag) and dips north-east. According to the 1927 minister of mines report these two fissures likely intersect.

The author accepted the mineral inspection as an assignment in geology 409 and submits the report with intent to determine the minerals present and their paragenisis.

It is noteworthy that the Aluminum Company of Canada proposes to develop this region as an industrial site for aluminum production. This development may open an economic route for ore concentrate shipment from properties in this region.that were previously inaccessible. Outlet by the Ootsa Lake Burns Lake, route would probably be too costly.

MATERIAL AND ACKNOWLEDGMENTS

The samples examined were given to the author by Dr. R. Thompson of the University of British Columbia. The original collector was G.A.Dirom.

The author thanks: Dr. Thompson for the X-Ray verification of Bournonite and for his assistance throughout the work; J. Donnan of the university for his expert polishing; and Dr. H. Warren also of the same university for his information on the occurrence of copper, lead and silver sulpho-salts.

What kind of porphyry?

MINERAL DESCRIPTIONS

Macroscopic Inspection

From inspection of the samples the mineralizing solutions, hydrothermal, deposited their content in fractures in the porphyritic rock. Some of these fractures are smaller than a millimeter across and traverse the enclosing rock to the boundaries of the sample.

The non metallic minerals present are siderite and quartz, the former is alternatively banded with the galena the latter is disseminated throughout the metallic mineral.

The ore minerals identified by macroscopic work are:

1 galena - plentiful
2 arsenopyrite - plentiful
3 pyrite
4 sphalerite - plentiful
5 chalcopyrite - very small inclusions
6 tetrahedrite
7. Pyrrhotite.

The galena occurs massive in intimate association with the siderite and occurs in the fractures wall to wall. The galena was identified by: perfect cubic cleavage; hardness of 2.5; high gravity; and by its indicative metallic lustre.

Arsenopyrite occurs massive in one sample and disseminated throughout the wall rock in other samples. It was identified by: silver white metallic colour and lustre; hardness of 6; and by arsenic fumes given off when heated on charcoal.

Pyrite also occurs disseminated throughout the wall rock. It was identified by: yellow white metallic colour; hardness of 6; and cubic nature.

Sphalerite occurs disseminated throughout the minerals present and associated with them all. It was identified by: high symetry cleavage; hardness of 4; and by adamantine lustre.

The tetrahedrite is very plentiful in one sample marked #10. Its black colour and extensive brittleness identified it sufficiently - microscopic work proved its occurrence.

Chalcopyrite was identified by its softness as compared to pyrite, and by its metallic colour.

Microscopic Inspection

The following minerals were identified by microscopic inspection and by microchemical tests:

1 galena

2 tetrahedrite

3 sphalerite

5 arsenopyrite

6 chalcopyrite

7 pyrite

8 bournonite

9 limonite - Pyrrhotite.

Each determination is given in the following summary of inspection.

Galena (PbS)

Galena was determined by: galena white colour; perfect cleavage with triangular pits; hardness of B; slight sectility; isotropism; and by etch tests. Etch tests are: $HgCl_2$, KOH, KCN, negative; HCl tarnishes iridescent; $FeCl_3$ tarnishes iridescent; HNO_3 gave effervescence and tarnishes blackish brown.

Tetrahedrite ($3\ Cu_2S \cdot Sb_2\ S_3$) + Ag

Tetrahedrite was determined by: grey colour slightly darker than galena with relief from galena; hardness of B; brittleness giving blackish brown powder when scratched; isotropism; and by etch and microchemical tests. Etch tests were: $HgCl_2$, KOH, KCN, HCl, $FeCl_3$, negative; HNO_3 fumes tarnished brownish black. A selected particle of mineral free from chalcopyrite was taken and leached with successive applications of HNO_3, 1:1; When no further tests of copper were evident the residue was leached with HCl and a transferred drop gave a positive test for antimony showing orange hexagons with the addition of a minute particle of cesium iodide. Silver was determined present by microchemical tests.

Sphalerite (ZnS) + Fe

Sphalerite was identified by: dark grey colour; hardness of C; strong brown internal reflection; white powder when scratched; and by etch tests and microchemical tests. Etch tests were: $HgCl_2$, KOH, KCN, HCl, $FeCl_3$ negative; HNO_3 fumes tarnished black. A particle taken for microchemical test and leached with HNO_3 gave star shaped crystals with the addition of mercuric thiocyanate solution.

Arsenopyrite (Fe As S)

Arsenopyrite was identified by: white colour; poor polish; hardness F; strong anisotropism, brown to violet; diamond shaped grains; and by etch tests and microchemical tests. Etch tests were: $HgCl_2$, KOH, KCN, HCl, $FeCl_3$ negative; HNO_3 stained iridescent. No effervescence was observed. Microchemical test gave strong pink colour on addition of mercuric thiocyanate to an HNO_3 leach. After addition of ammonium molybdate, drying and leaching again with 1.7 HNO_3, tiny yellow isometric crystals appeared proving the presence of arsenic.

Chalcopyrite (Cu Fe S_2)

Chalcopyrite was identified by: bright yellow colour; hardness C; scratching gave brittle black metallic powder; no discernible anisotropism; and by microchemical test. The microchemical test gave feathers of copper thiocyanate and pink colour when mercuric thiocyanate was added to an HNO_3 leach.

Pyrite (Fe S_2)

Pyrite was distinguished by: brown yellow colour; hardness F; and by cubic habit. Etch tests were $HgCl_2$, KOH, KCN, HCl, Fe Cl_3 negative - HNO_3 fumes tarnished brown with no effervescence.

Bournonite (Cu_2S 2PbS Sb_2 S_3)

Bournonite was not readily recognized as a different mineral from the galena and tetrahedrite until a second good polish was obtained on the section. Relief from the galena shows that both minerals are the same colour with the bournonite tending slightly grey with lesser amounts of light. Bournonite was identified by hardness of C; extreme brittleness; strong anisotropism. The anisotropic colours were somewhat variable with different grains. Some grains showed dark brown to green-grey to light grey; others showed dark brown to yellow-green to blue steel grey. Etch tests were $HgCl_2$, KOH, KCN, HCl, $FeCl_3$, HNO_3, and aqua regia negative. An X-Ray diffraction pattern was made by Dr. R.Thompson on grains from two different specimens and identified the mineral as bournonite.

Limonite? (Fe_2O_3 + H_2O)

A red colour surrounding hexagons of siderite and small fractures in the siderite were filled with a bright metallic mineral. No positive tests were made because the occurrence of limonite is rather unimportant and is probably only from surface weathering.

PARAGENISIS

Associations

The associations that lead the author to the paragenisis are summarized as follows:

1. Pyrite and arsenopyrite occur in the fracture walls.
2. Fractures in the galena are filled with sphalerite Tetrahedrite, bournonite and chalcopyrite as well as with quartz. These fractures are probably solidification fractures.
3. Chalcopyrite traverses pyrite but leaves an indicative overall isometric structure.
4. Chalcopyrite traverses tetrahedrite and sphalerite and occurs with tetrahedrite in wall rock fractures.
5. Sphalerite is included within tetrahedrite and has the appearance of being replaced by the tetrahedrite. Bays are evident in most grains.
6. Chalcopyrite does not traverse bournonite but is associated with it.
7. Galena also traverses pyrite.

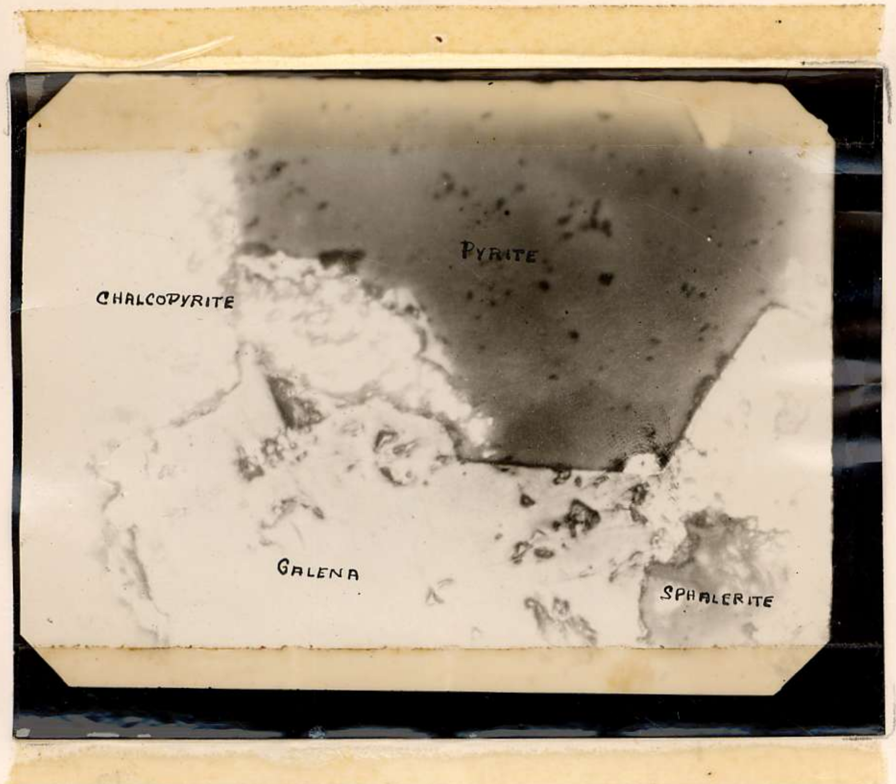

FIGURE 1

Magnification = 750 From Section No 10-1

Pyrite - dark Chalcopyrite - bright

Galena - grey white Sphalerite - Grey

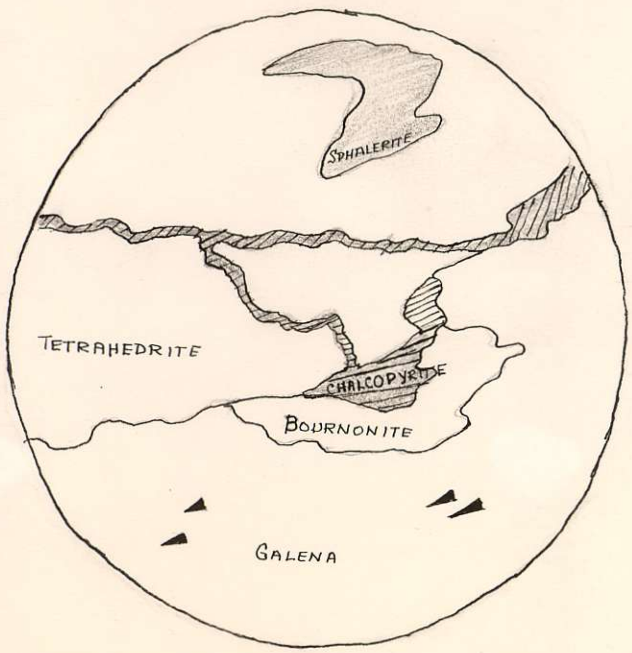

FIGURE 2. From Section 10-2

Diagram showing Chalcopyrite, Tetrahedrite, Bournonite, relationship.

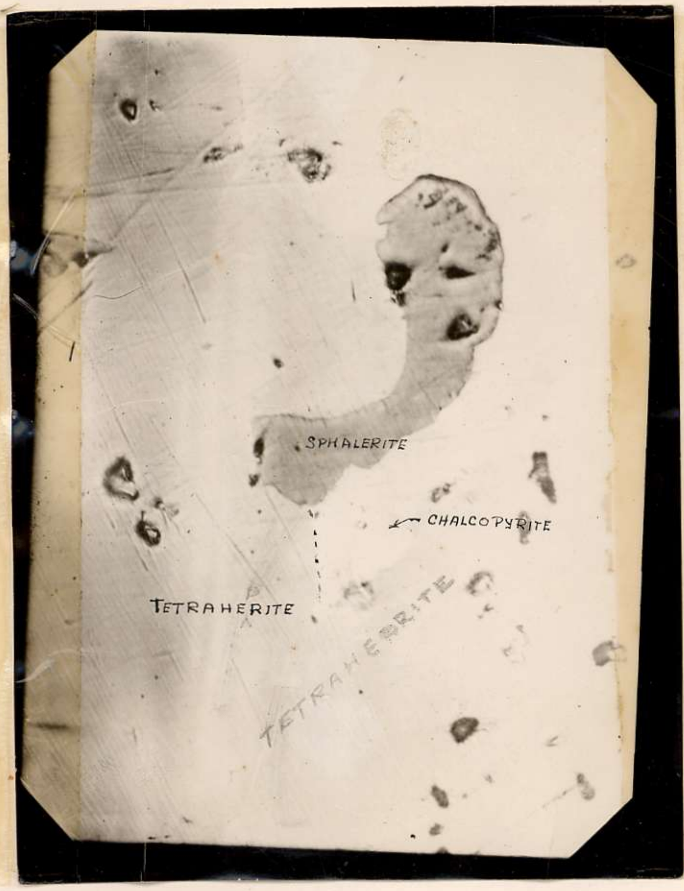

FIGURE 3

Magnification 750 From Section No 5

Replacement of Sphalerite by Tetrahedrite

One small inclusion of Chalcopyrite is visible

The picture would not bring out the Chalcopyrite as shown in Figure 2.

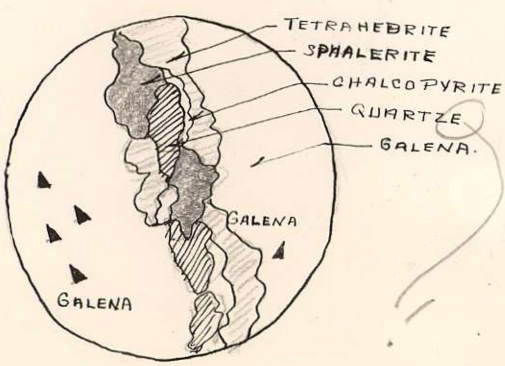

FIGURE 4 Section No. 5

Diagram showing fracture replacement of Chalcopyrite Sphalerite and Tetrahedrite in Galena

Order of Deposition

The probable order of deposition is as follows:

1. Arsenopyrite and pyrite
2. Galena and siderite
3. Sphalerite
4. Tetrahedrite
5. Bournonite and chalcopyrite

Arsenopyrite is thought to be first because it occurs throughout the wall rock and, moreover, is a high temperature mineral. Pyrite comes before the galena but since there is no indication of order between the arsenopyrite and pyrite there is no attempt to discuss which was first to be deposed. Galena and siderite probably follow the arsenopyrite and pyrite. Both are on the fracture walls but do not occur as far into the wall rock as the arsenopyrite. Sphalerite, being in the galena solidification fractures, probably follows galena. The cusps and bays evident in the sphalerite included in tetrahedrite seem to indicate that tetrahedrite follows the sphalerite. The association of the chalcopyrite and the bournonite and the fact that bournonite is caused by the occurrence of excess copper indicates that these two minerals solidified at the same time. The chalcopyrite traverses tetrahedrite and sphalerite and, therefore, is thought to be the last mineral to occur.

CONCLUSION

All minerals can be freed by grinding except chalcopyrite. Chalcopyrite Stringers magnified about 750 times on a 2 mm field are still only a tenth of the field. Tetrahedrite grains are all large enough to be free with grinding to pass 65 mesh. There are large amounts of tetrahedrite present and this mineral contains the silver. The antimony present as it is in this mineral may cause smelter penalties on the galena and, therefore, some tests should be carried out to determine the content of this element in galena concentrates. All sphalerite and galena can be freed. No trace of gold was found in either the arsenopyrite or the pyrite. No meneghinite was found but probably occurs. Why?

The minerals present in probable order of deposition are:

1. arsenopyrite and pyrite
2. galena
3. sphalerite
4. tetrahedrite
5. chalcopyrite and bournonite.

MINERAL.	SECTION NUMBER								
	OK	X	OK	OK	X	X	X	X	OK
	5	16	10-1	10-2	10-3	1	3	8	0
GALENA	X		X	X	X	X	X		X
TETRAHEDRITE	X		X	X	X	X			X
SPHALERITE	X		X	X	X	X	X	X	
ARSENOPYRITE	X	X		X			X		X
BOURNANITE	X		X	X	X	X			X
PYRITE			X	X	X	X		X	X
CHALCOPYRITE	X		X	X	X	X		X	X

Sections checked. Feb. 26/55

Some discarded.

Keep 5
10-1
10-2
0