A MINERALOGICAL STUDY OF SAMPLES FROM THE STANDARD MINE, OLIVER, B.C.

600342

A Report
Presented to
Professor R.M. Thompson
Department of Geology
The University of British Columbia

In Partial Fulfilment
of the Requirements for the Course
Geology 409
in
Geological Engineering

E.L.Arnott
April 1963

CONTENTS

Introduction 1

General Geology 1

Mineralogy

    Megascopic 3
    Microscopic 3
    Minerals 5

Conclusions

    Paragenesis 5
    Type of Deposit 6

Bibliography

ILLUSTRATIONS

Figure 1 Geographical and Geological Map 2

Figure 2 Paragenesis Chart 6

Figure 3 Galena and Pyrite 7

Figure 4 Subhedral Pyrite 7

Figure 5Hessite and Pyrite 8

Figure 6 Hessite and Galena 9

Figure 7 Chalcopyrite in Sphalerite 9

A MINERALOGICAL STUDY OF SAMPLES FROM THE STANDARD MINE,OLIVER, B.C.

Introduction

This study was carried out as the final assignment in Mineralography, Geology 409, at the University of British Columbia. The report will be concerned mainly with the description of minerals found in the Standard Mine and also with a possible origin of these. The mine is located in southern Okanagan Valley about two miles northwest of Oliver, B.C.[1] There is a short (1/4 mile) gravel road connecting the mine with a secondary public highway. This road is also gravelled. The total travel distance from Oliver to the Mine is about five miles.

General Geology

The first mining interest in this general region occurred back in the late 1800's when the claims on which the Standard Mine is located were owned by the Fairview Consolidated Gold Mines Company.[2] Another report in 1933[3] states that the mine was owned at that time by A.S. Hatfield and associates of Penticton, B.C. In 1962, the mine area and mine itself were mapped by the author and fellow students.[4] At this time the mine was being developed by Mr. Smeddle of the Continental Consolidated Mines Limited.

The main mines of the Fairview Gold Camp were founded in

---

[1] See Figure 1 - Geographical and Geological Map.

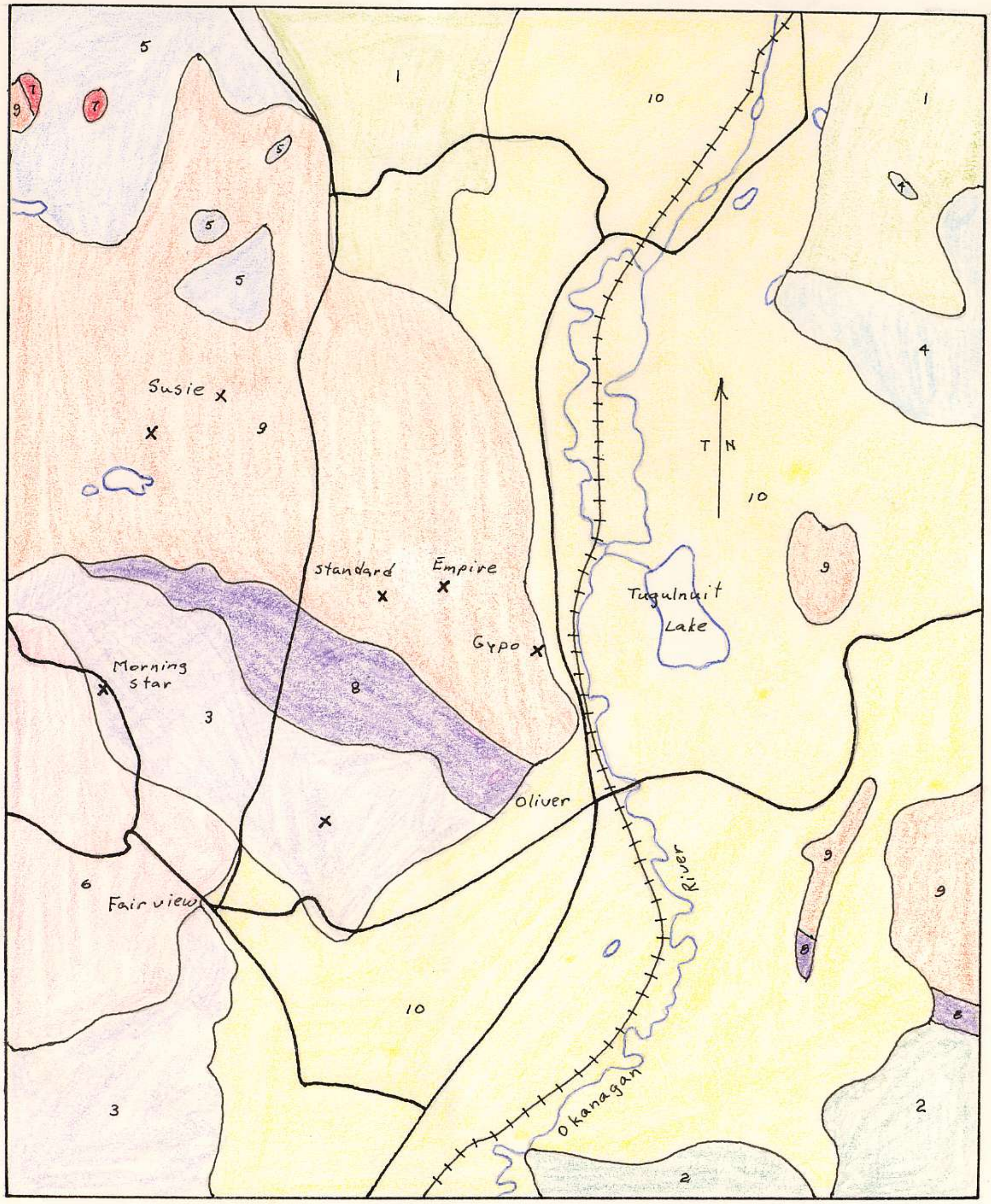
[2] Annual Report of the Minister of Mines 1897, Victoria, B.C., Queen's Printer 1898, p. 602.

[3] Annual Report of the Ministerof Mines 1933,Victoria, B.C., King's Printer 1933, p. 168.

[4] Arnott, E.L. The Mineralogy and Petrology of Standard Mine, Oliver, B.C. B.A.Sc. Thesis, Geology Department, University of British Columbia.

Figure 1

Geographical and Geological Map Scale 1"= 1 mile
From Bostock, H.S. Map 341A Keremeos, B.C., Canada,
Department of Mines and Resources, Mapped 1927, 1930



Vaseaux Fm.	1	Fairview Granodiorite	6
Gneiss	2	Diorite	7
Kabau Gp.	3	Oliver Syenite	8
Gneissic Granite	4	Oliver Granite	9
Metamorphics	5	Alluvium	10

quartz veins which cut the Kabau Group of metamorphosed, stratified, sedimentary rocks. These mines are all within about one mile of the contact between the Oliver granite and the Kabau Group.[5] The quartz vein at the Standard Mine cuts the Oliver granite and is cut by both an augite lamprophyre dyke and also several faults. This vein strikes south-south-westerly and dips to the east at approximately sixty degrees.

Mineralogy

Megascopic

The following minerals are found along fractures in the quartz vein : sphalerite, galena, pyrite, chalcopyrite, hessite, and gold. All these can be identified in hand specimens. However, the gold is seen very infrequently. Sphalerite has a brownish-yellow colour and a yellowish streak. It gives a positive microchemical test for zinc and probably contains some iron. Galena has a typical cubic form and cleavage with a high metallic luster. Pyrite has a pale yellow color and a hardness greater than six (Mho's Hardness Scale). Chalcopyrite's colour is bronze-yellow, somewhat brighter than that of pyrite, and its hardness is approximately four. Hessite has a lighter colour than galena and is quite sectile. It gives a positive microchemical test for both silver and tellurium. Gold occurs as small flakes and particles along fractures in the quartz and is sectile. This occurs along wide fractures and appears to cross and accompany many of the fractures filled by sulphides.

Microscopic

Sphalerite, (Zn,Fe) S - Sphalerite is isotropic and dark grey in colour. It shows few scratches but is often pitted due to its good cleavage. It has a hardness of approximately C and yields a yellow to brown powder when scratched. Some

---

[5] Bostock, H.S. Map 341A Keremeos, B.C. Canada, Department of Mines and Resources, Mapped 1929, 1930.

grains show a deep cherry-red internal reflection under crossed nicols. Microchemical tests are positive for zinc.

Galena, PbS - Galena has a high reflectivity and shows many fine scratches. It is isotropic and has a white colour. Due to its good cubic cleavage, galena usually has triangular pits on the polished surface. It has a hardness of B. Microchemical tests were positive for lead and negative for silver.

Pyrite, FeS_2 - The pyrite crystals are generally subhedral and take a fair polish. They are highly pitted and have a pale yellow colour. Pyrite is isotropic and has a hardness greater than E.

Chalcopyrite, $CuFeS_2$ - Chalcopyrite takes a good polosh showing only very fine scratches. It has a bronze-yellow colour with very weak anisotropism. Under crossed nicols it has a dark green colour. Its hardness of C and lack of sectility distinguish it from gold.

Hessite, Ag_2Te - Hessite takes a fairly good polish with a few fine scratches. It has a pale grey-white colour with a strong yellowish-tan tinge. It has a hardness of approximately B and shows no relief against galena. Hessite is anisotropic and has the following colours under crossed nicols : blue, reddish-tan and tan. It is also spotted under crossed nicols. This is apparently due to its relic isometric structure.[6] It is also sectile. Hessite gave the following etch tests : HNO_3 , effervesces almost immediately and leaves a brownish-black stain; $FeCl_3$, stains fiery orange, red, blue, greenand yellow; $HgCl_2$, strong reddish-brown stain; KCN, very slow positive reaction; HCl and KOH negative. Microchemical tests were positive for both silver and tellurium.

Gold, Au - The gold takes a good polish with many fine scratches. However, the particles are quite small and seldom seen in the polished sections. It is isotropic and has a slight-

---

[6] Uytenbogaardt, W. Microscopic Identification of Ore Minerals. Princton, New Jersey, Princton University Press, 1951.

ly brighter colour than chalcopyrite. Gold's high sectility easily distinguishes it from chalcopyrite.

Minerals in Decreasing Order of Abundance

Primary	
Quartz	
Sphalerite	300 µ to almost massive fracture fillings
Galena	20 µ to almost massive fracture fillings
Pyrite	crystals up to 3 cm.
Chalcopyrite	1/2 µ up to 3 mm.
Hessite	40u up to fracture fillings approximately 1 mm. thick
Gold	16 µ up to flakes approximately 3 mm. across.
Secondary	
Sericite	

Conclusions

Paragenesis

As previously mentioned, the above minerals occur in fractures in the quartz vein. This indicates that the vein probably formed first and was later fractured and had minerals deposited in the fractures. The pyrite appears to have been deposited prior to the other minerals. When the other minerals crystallized they filled fractures in the pyrite and also replaced portions of the crystals. Thus in Figure 3 pyrite is seen to be partially replaced by galena and in Figure 4 the pyrite crystal has again been partially replaced by hessite. In Figure 5 small embayments and fractures in the pyrite are filled with quartz along with hessite and galena. It is thought therefore that quartz was deposited again after the pyrite had crystallized and fractured. Figure 5 also shows many of the pyrite grains almost completely enclosed in hessite. The other common occurrence of hessite is at the end of small fractures, usually closely associated with galena (see Figure 6). Chalcopyrite occurs as small blebs in hessite, galena and sphalerite. In the latter case it appears to have exsolved from the sphalerite. In Figure 7 sphalerite is seen to be riddled with extremely small and large blebs of chalcopyrite. The gold as seen in the hand specimens appears to be closely associated with hessite. However, in some cases it, too, is found in small fractures away from hessite. The occurrences of minerals as outlined above has led to the paragenetic sequence shown in Figure 2.

Type of Deposit

mesothermal

This is a typical hypothermal vein deposit. The chalcopyrite exsolved in sphalerite indicates a temperature of formation of approximately 550°C. The vein thins and bulges and is fairly coarse-grained. No vugs, banding or crustification of minerals was seen. There is little if any wall rock alteration of the granite. All these properties and also the mineral assemblage is typical of hypothermal deposits.

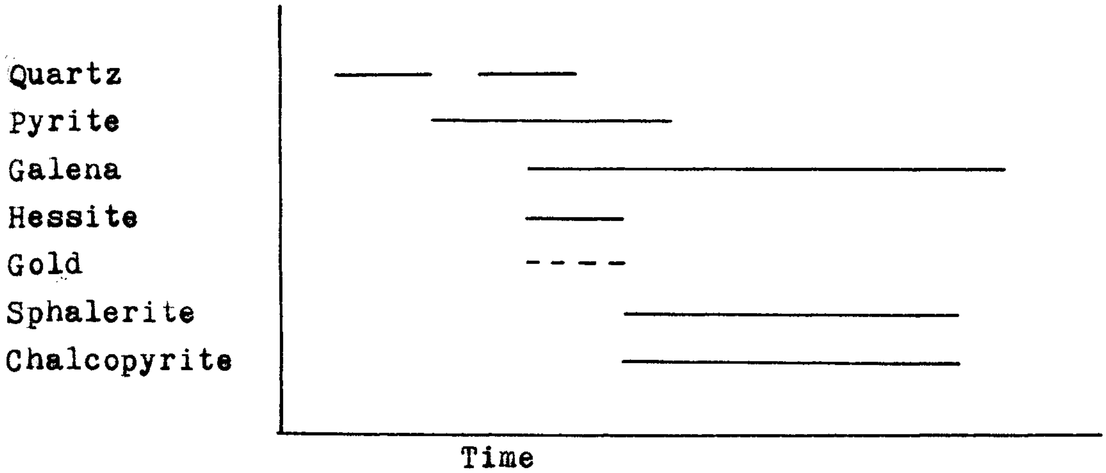


Figure 2
Paragenesis Chart

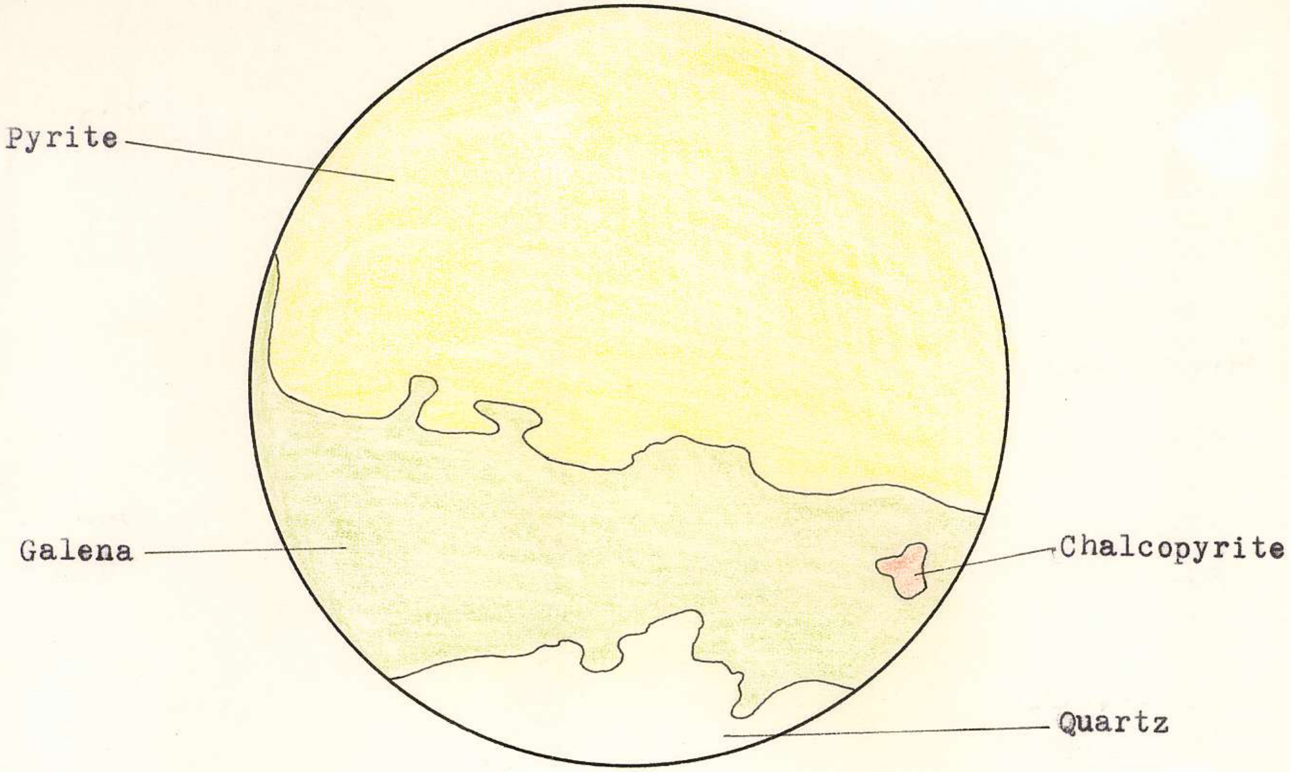


Figure 3
Galena and Pyrite Scale 60X

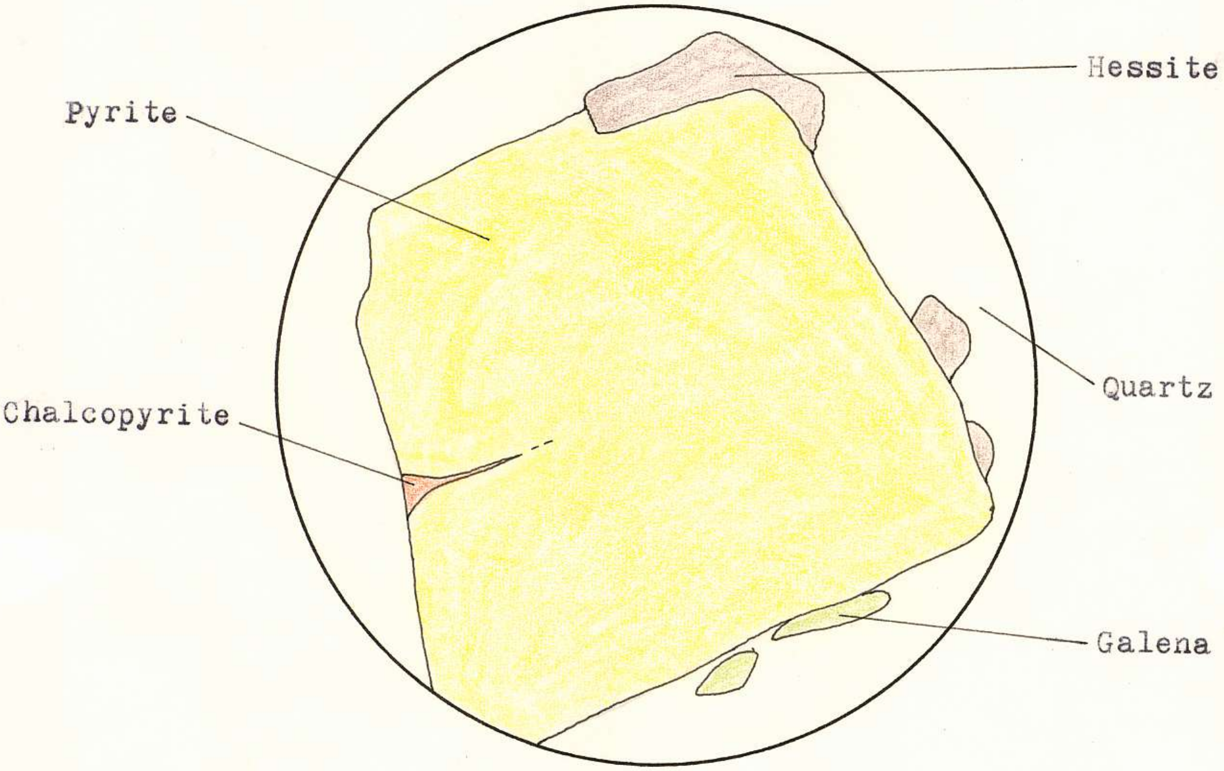


Figure 4
Subhedral Pyrite Crystal Scale 30X
From Section B

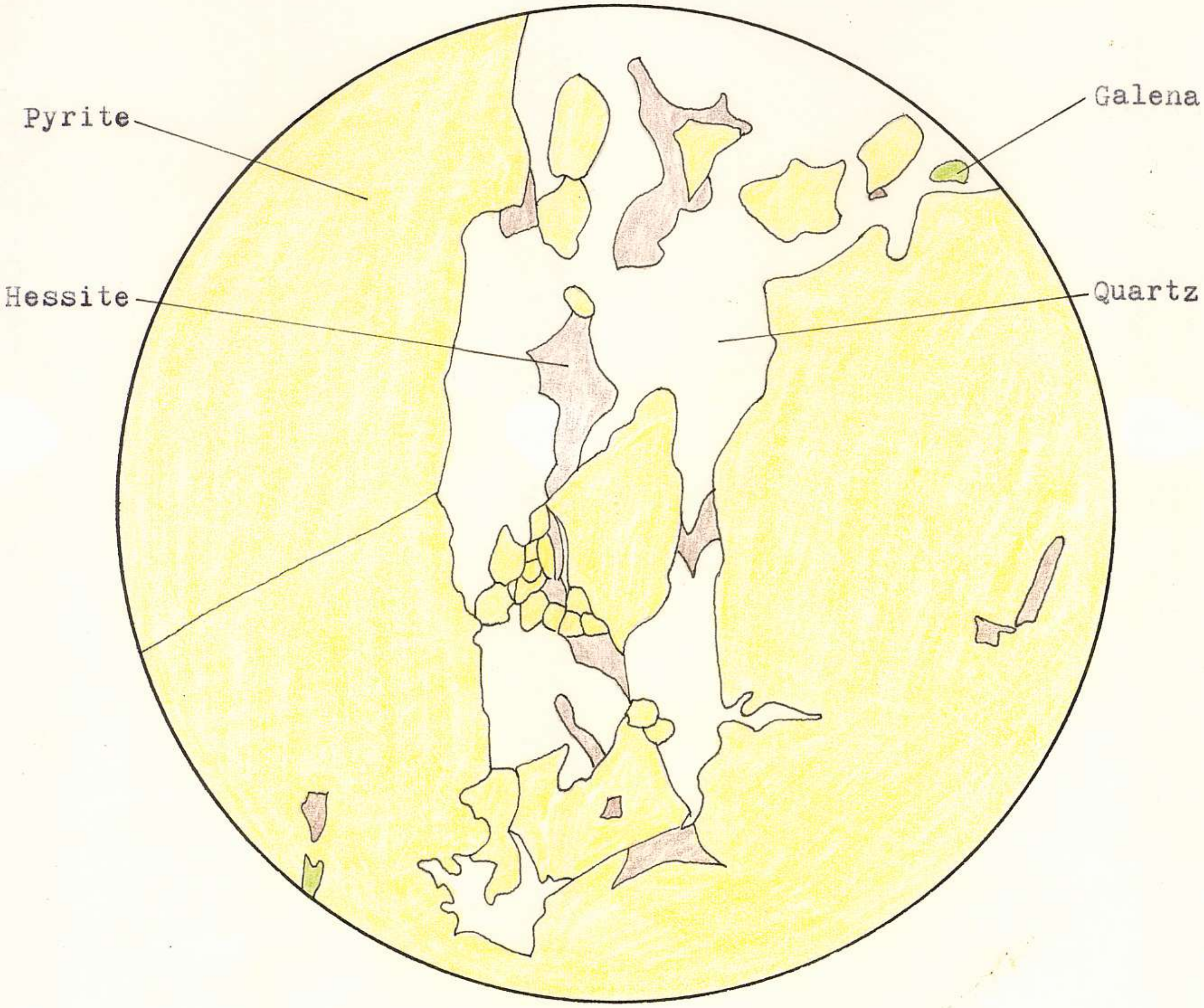


Figure 5

Hessite and Pyrite Scale 15X

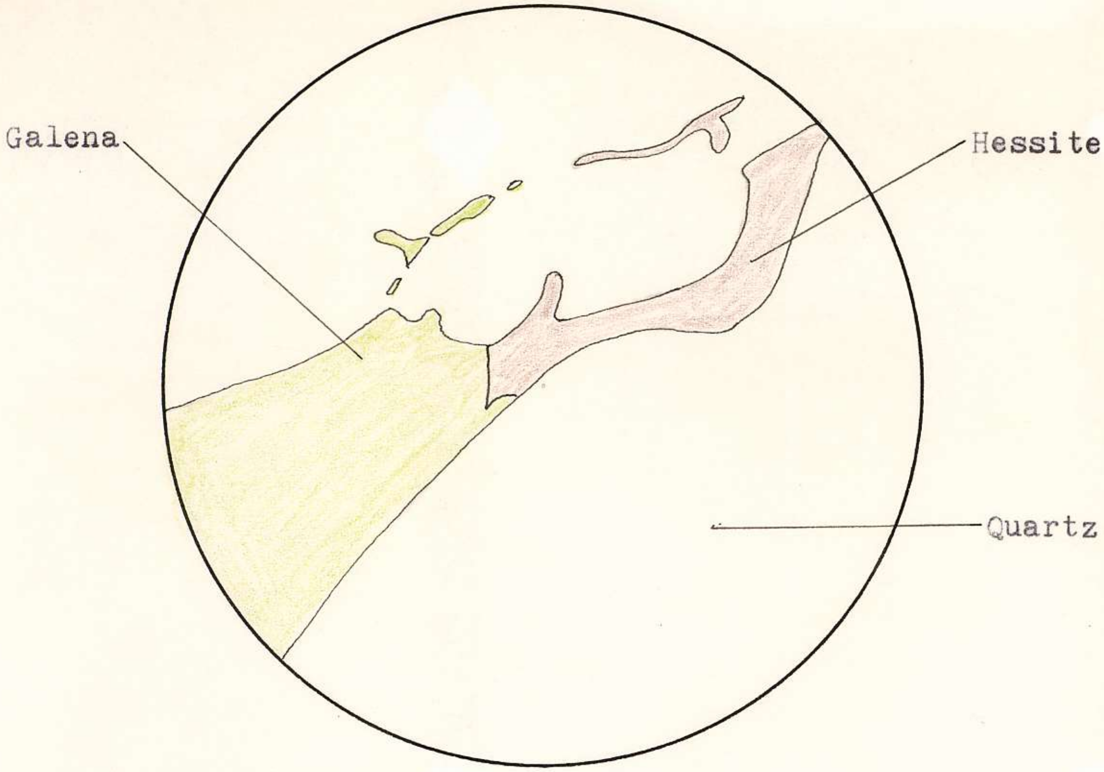


Figure 6
Hessite and Galena Scale 60X

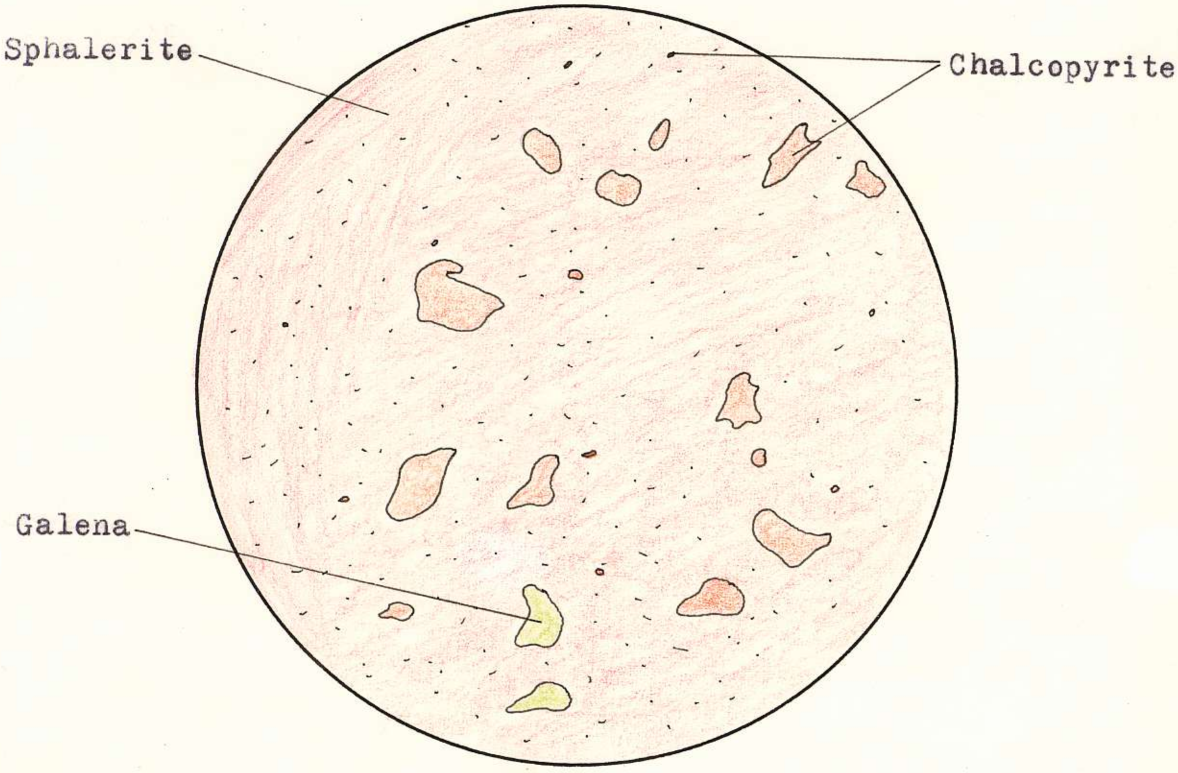


Figure 7
Chalcopyrite in Sphalerite Scale 230X

BIBLIOGRAPHY

Annual Report of the Minister of Mines, 1897 , Victoria, B.C., Queen's Printer 1898.

Annual Report of the Minister of Mines 1933, Victoria, B.C., King's Printer, 1933.

Arnott, E.L., The Mineralogy and Petrology of Standard Mine, Oliver, B.C., B.A.Sc.Thesis, Geology Department, University of British Columbia.

Bostock, H.S. Map 341A Keremeos, B.C., Canada, Department of Mines and Resources, Mapped 1929, 1930.

Uytenbogaardt, W. Microscopic Identification of Ore Minerals. Princton, New Jersey, Princton University Press, 1951.