A MINERALOGICAL EXAMINATION OF A SUITE OF ROCK CREEK SAMPLES

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Abstract

A study of the Rock Creek samples reveals no gold or silver-bearing minerals. The galena, which occurs in the mineralization, could possibly carry some silver values. An insufficient amount was present, however, to warrant an assay. It has been brought to the attention of the author that recent samples taken in the area have assayed fair values in silver. The possibility of detecting silver-bearing minerals in the specimens was slight because of the sparse mineralization contained in them.

A Mineralogical Examination of a Suite of Rock Creek Samples

Introduction

Purpose:

The purpose of this report is to describe and correlate with regard to mutual relations and paragenesis, the various minerals occurring in the Rock Creek samples.

Location:

The Rock Creek samples were taken by Mr. Smith of Westbridge. The location of the mineralization is in the vicinity of Smith Creek near Zamora. Zamora is situated about ten miles north of the town of Rock Creek which is on the Kettle river in south-central British Columbia.

Acknowledgements:

The author is indebted to Dr. H.V.Warren and Dr. R.M. Thompson for their assistance in attempting to determine minerals detected in the microscopic examination of polished sections. The author is also grateful for the guidance of Mr. J.Donnan in the preparation of the polished

sections, and to Mr.R.Steiner for the taking of micro-photographs.

Information regarding microchemical tests, etch tests, and the various physical properties of minerals, was obtained from the United States Geological Survey Bulletin 914, 1940, by M.N.Short entitled: "Microscopic Determination of the Ore Minerals."

Geology:

As the exact location of the area under consideration is not known to the author, a brief description of the general geology in the vicinity of the area will be given.

North of the town of Rock Creek in the vicinity of the Highland-Bell mine on Wallace mountain a diorite stock cuts older metamorphosed rocks. Just south of Rock Creek the Geological Map of the Dominion of Canada (1945) shows exposures of intrusive granitic rocks related to the Nelson batholith and sedimentary rocks believed to be Carboniferous- possibly Permian- in age. Some Tertiary volcanics also occur in the area.

Megascopic Examination

The samples examined are composed of a sparse sulfide mineralization in a siliceous and carbonate gangue. The sulfides- sphalerite, pyrite, chalcopyrite, and galena, although somewhat concentrated along fractures, are disseminated throughout the gangue minerals. Small stringers of a soft white gangue mineral vein all other gangue minerals and sulfides alike.

Light to dark brown sphalerite is the dominant sulfide in most of the specimens and occurs in grains up to $\frac{3}{8}$" in diameter. The average grain size of this mineral is possibly $\frac{1}{8}$". The sphalerite appears to be concentrated in sub-parallel fractures although some of the specimens show it well disseminated throughout the gangue.

Pyrite occurs as euhedral to subhedral grains which have a maximum diameter of about $\frac{1}{4}$". Very little pyrite occurs in the quartz- the major concentration being confined to the greenish gangue mineral.

Galena occurs in fine grains restricted to fractures in the siliceous gangue. Some of the larger grains show a fine cubic cleavage.

Chalcopyrite forms a small percentage of the mineralization and appears to be closely related to the galena. Irregular grains of this mineral occur up to $\frac{1}{4}$" in length.

At least three gangue minerals are evident- quartz, an early carbonate, and a late carbonate. The quartz is highly fractured and individual grains, in places, are cemented

by the later carbonate. A soft white gangue mineral veining the afore-mentioned gangue minerals also veins the sulfide mineralization.

Microscopic Examination

Minerals detected in a microscopic examination of the polished sections are, in order of abundance, sphalerite, pyrite, chalcopyrite, galena, covellite, and two unidentified minerals "X" and "Y".

Sphalerite:

Sphalerite is the dominant sulfide in polished sections 4 and 5 and also occurs in section 2. Grains of the mineral occur up to 1 cm. in length, with an average grain size of about 5 mm. A remarkable feature of this sphalerite is its extremely high content of chalcopyrite. The chalcopyrite occurs for the most part as lineated blebs in the former mineral which suggests an exsolution of the chalcopyrite along cleavage boundaries of the sphalerite. Unidentified minerals "X" and "Y" and small grains of galena also occur in the sphalerite.

With regards to paragenesis the sphalerite is later than the pyrite as it veins this mineral along fractures. If the lineations of chalcopyrite and the closely associated mineral "X" are due to exsolution, the sphalerite could be regarded as being contemporaneous with, or slightly later than these minerals.

Pyrite:

The pyrite which can be seen in all of the polished

sections is highly fractured and is veined by the other sulfides. Grains, for the most part equidimentional, occur up to 2 mm. in diameter with the average grain size being possibly 1mm. in diameter.

In polished section 1 it is evident that the pyrite is concentrated in the green gangue mineral. Grains of pyrite, a few showing the original crystal form, are replaced by the gangue mineral. The green gangue mineral, apparently later than the quartz, may have moved into weak zones in the quartz in which the pyrite was concentrated.

Chalcopyrite:

The chalcopyrite occurs as lineated blebs in sphalerite, as isolated grains in the gangue, and as isolated blebs is galena. The lineated grains in the sphalerite are up to .75mm. long and average between .1 and.2mm. The grains occurring in the gangue are generally much larger than those in the sphalerite- a few of the grains being as much as 2 mm. in length.

Chalcopyrite veins the pyrite and, as has been previously mentioned, is probably slightly later than, or contemporaneous with the sphalerite. Some irregular veinlets of chalcopyrite cutting through the sphalerite suggest the former mineral was, in some cases at least, later than the sphalerite.

Galena:

Galena occurs mainly as veinlets and irregular grains in the highly fractured quartz. Small amounts are found

in the sphalerite and as blebs in grains of chalcopyrite. Grains up to 3mm. long can be detected although the average grain size is about 2mm.

The galena veins pyrite and is probably later than the sphalerite as vein-like protruberances of the mineral penetrate the sphalerite and in places the latter mineral appears to be replaced. The contacts of the galena and chalcopyrite are for the most part rounded. Although in one instance the galena has a small veinlet cutting into the chalcopyrite, the presence of blebs of galena in chalcopyrite as well as blebs of chalcopyrite in galena would suggest a contemporaneous formation. If temperatures of crystallization were taken into effect the galena would possibly be slightly later than the chalcopyrite.

Covellite:

Covellite occurs in polished section 2 as very small veinlets. These veinlets up to .2mm long appear, to some extent, to band chalcopyrite grains. Since so little of this mineral is present is is impossible to determine its position in the paragenesis of the minerals.

Mineral "X":

The unidentified mineral "X" occurs intimately associated with chalcopyrite in sphalerite. The grain size ranges from about.1 to .2mm.

Mineral "X" is creamy white, with a hardness of about 3.5 and is apparently non-magnetic. Etch tests are negative in practically all cases- the exception

being with nitric acid which gives a very light brown stain. The mineral is anisotropic with polarization colours of gray, mauve, and blue. Millerite and pyrrhotite fit the properties quite closely. Millerite is, however, much harder than 3.5 and no michrochemical test for nickel was positive. Pyrrhotite, on the other hand, is generally somewhat magnetic.

The contact of mineral"X" and chalcopyrite is in all cases mutually rounded, suggesting the two minerals were contemporaneous in their formation. Very few instances were observed in which mineral "X" occurred in sphalerite without contacting chalcopyrite.

Mineral "Y"

Mineral "Y" is slightly darker than galena but has about the same hardness. It is anisotropic, has a fibrous habit, and gives no etch reaction with ferric chloride. Nitric acid instantaneously turns the mineral black but potassium hydroxide has no effect. The mineral which fits the description most closely is boulangerite.

Mineral "Y" occurs in sections 4 and 5 and in the latter section one grain is about .5mm. long. The mineral is found in the sphalerite mainly as small isolated grains.

Mineral "Y" is later than the sphalerite as it veins the latter mineral. Its relation to the chalcopyrite and galena are obscure as it does not contact them. The late carbonate gangue mineral does, however, cut through the mineral.

Gangue Minerals:

Since the author was not concerned with the gangue minerals a description of them will be brief. The gangue minerals consist of quartz and at least two generations of carbonate. The quartz is highly fractured and is invaded by the later carbonates. The restriction of the pyrite to the green gangue mineral in section 1 has already been mentioned.

Paragenesis

The paragenesis of the minerals has already been discussed to a certain extent. Pyrite appears to be the first sulfide deposited. The relationships between the other sulfides, however, is more obscure. If the chalcopyrite and mineral "X" are lineated along the cleavage boundaries of the sphalerite they may be considered as being contemporaneous with, or slightly later than, the sphalerite. Some irregular stringers of the chalcopyrite apparently veining sphalerite would suggest that at least some of the former mineral was later than the sphalerite.

Galena, for the most part, appears to be later than the sphalerite and could be contemporaneous with, or slightly later than, the chalcopyrite. Small protruberances of galena extend into the chalcopyrite, wich would suggest that the galena was later than the chalcopyrite. Small blebs of the minerals in each other, however, would possibly indicate a contemporaneous formation.

Little can be said about mineral "Y" excepting that it

is probably later than the sphalerite.

The possibility exists that the sphalerite, chalcopyrite, galena, and mineral "X" were introduced at approximately the same time. Different temperatures of crystallization could then effect their mutual relations.

Paragenesis

Chart showing sequence of introduction of elements

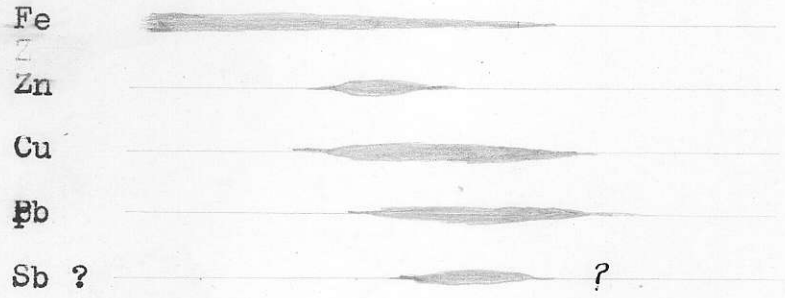
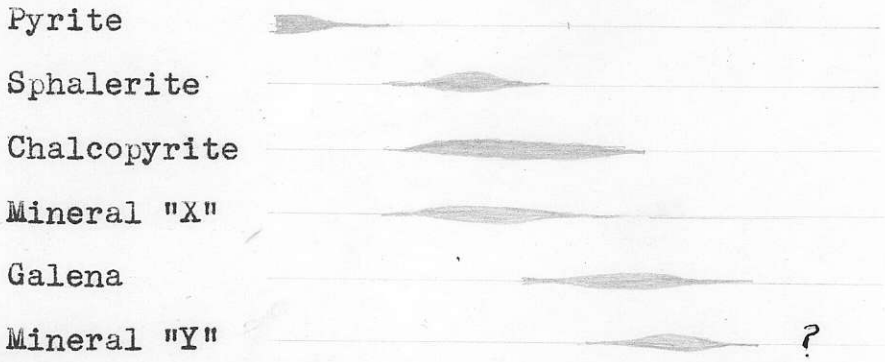


Chart showing sequence of introduction of minerals



Conclusions

Mineralogy:

The minerals which were detected in polished sections of the Rock Creek samples were: pyrite, sphalerite, galena, chalcopyrite, covellite, and two unidentified minerals "X" and "Y". Little can be said about the classification of the deposit with regards to conditions of formation. No minerals, usually assumed to indicate high temperature conditions of deposition, were observed, however, and the general mineralogy of the specimens is the type that might be found in mesothermal deposits possibly tending towards the epithermal.

List of Sections and Minerals Observed in Them

Section No. 1

- Pyrite
- Chalcopyrite
- Galena

Section No. 2

- Pyrite
- Galena
- Sphalerite
- Chalcopyrite
- Mineral "X" (Unidentified)
- Covellite

Section No. 3

- Pyrite
- Galena
- Chalcopyrite

Section No. 4

- Pyrite
- Sphalerite
- Chalcopyrite
- Galena
- "X"(unidentified)
- "Y"(unidentified)

Section No. 5

- Pyrite
- Sphalerite
- Chalcopyrite
- Galena
- "X"(unidentified)
- "Y"(unidentified)

Boulangerite ?
Possibly cubanite.
KMT

Bibliography

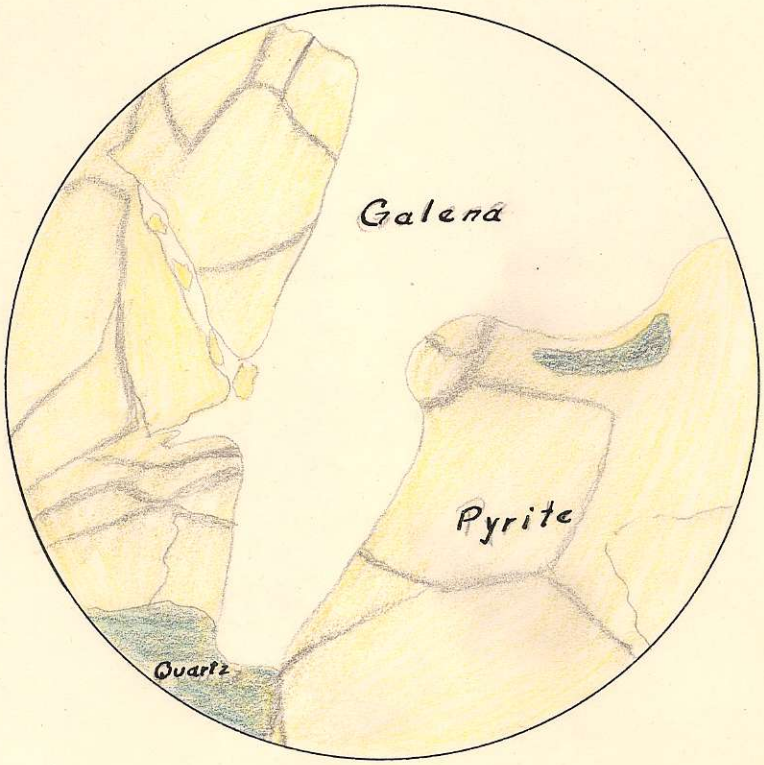
M.N.Short, "Microscopic Determination of the Ore Minerals," United States Geological Survey Bulletin 914, 1940.

SKETCHES AND MICRO-PHOTOGRAPHS

Sect. #1

Natural Size

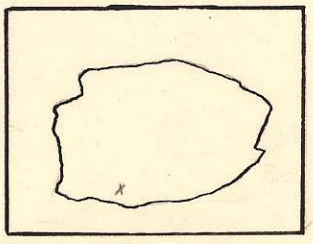
Shows distribution of sulfides with respect to the quartz and carbonate.

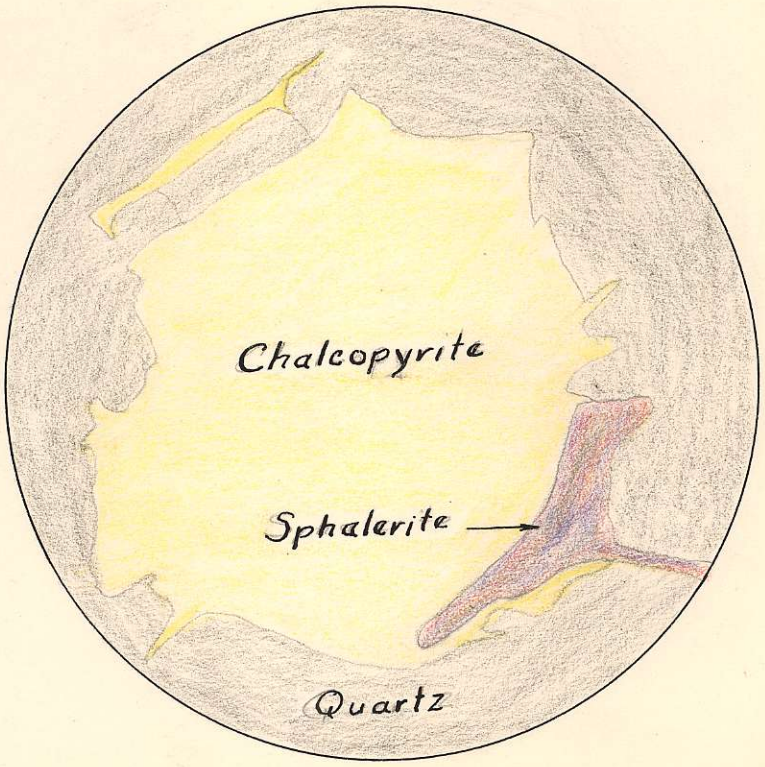


Sketch showing galena veining highly fractured pyrite.

x75

Sect. #2

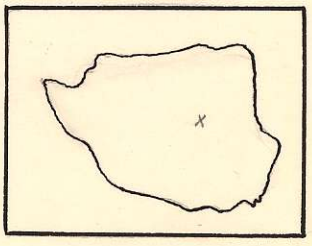


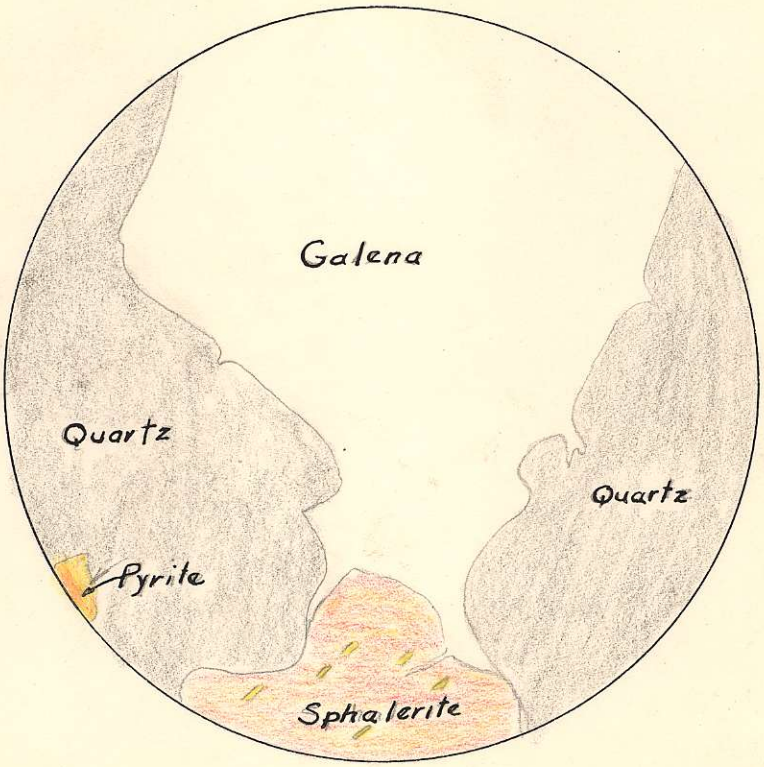


Sketch showing contacts of quartz chalcopyrite and sphalerite.

X75

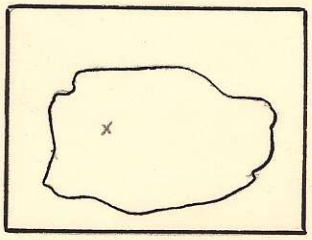
Sect. #5

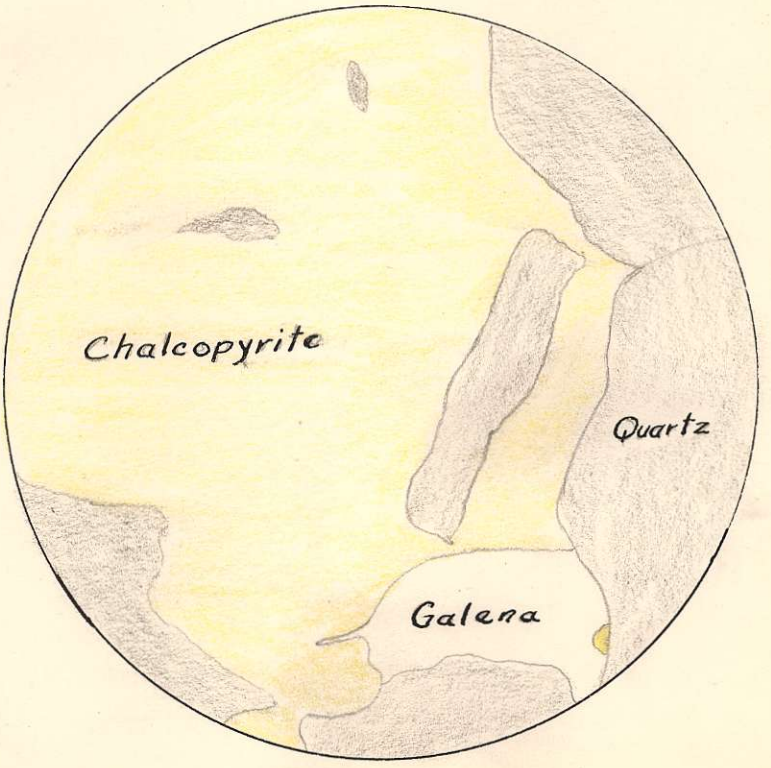




Sketch showing contacts of quartz
galena and sphalerite
X75

Sect. # 2

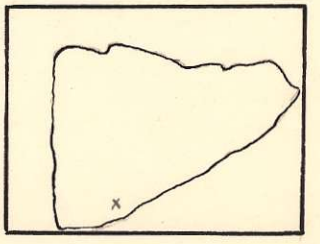


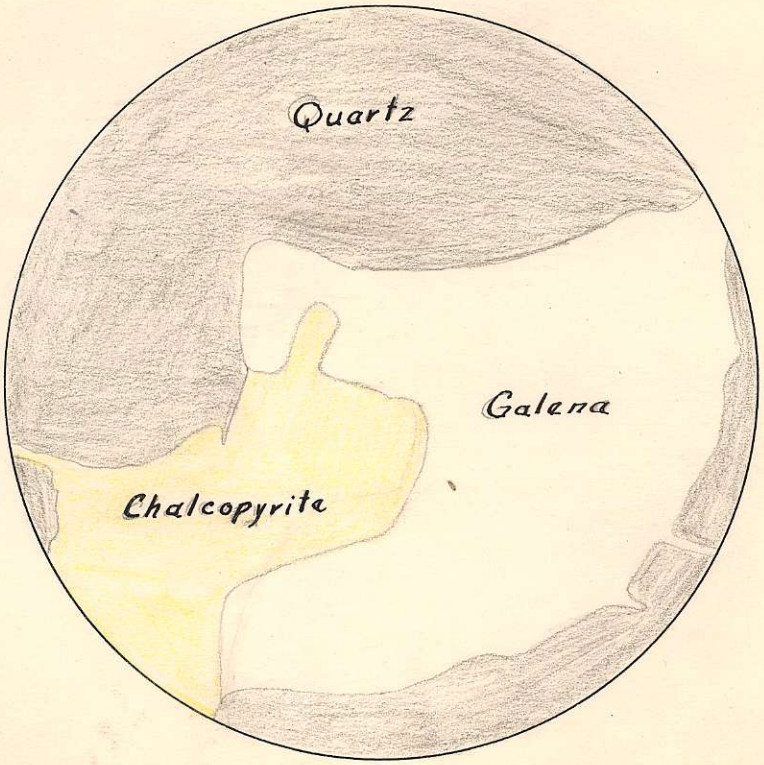


Sketch showing contacts of quartz chalcopyrite and galena.

X75

Sect. # 3

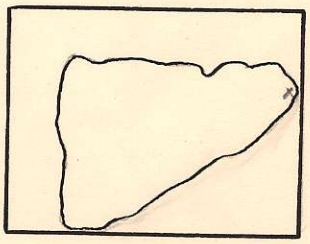


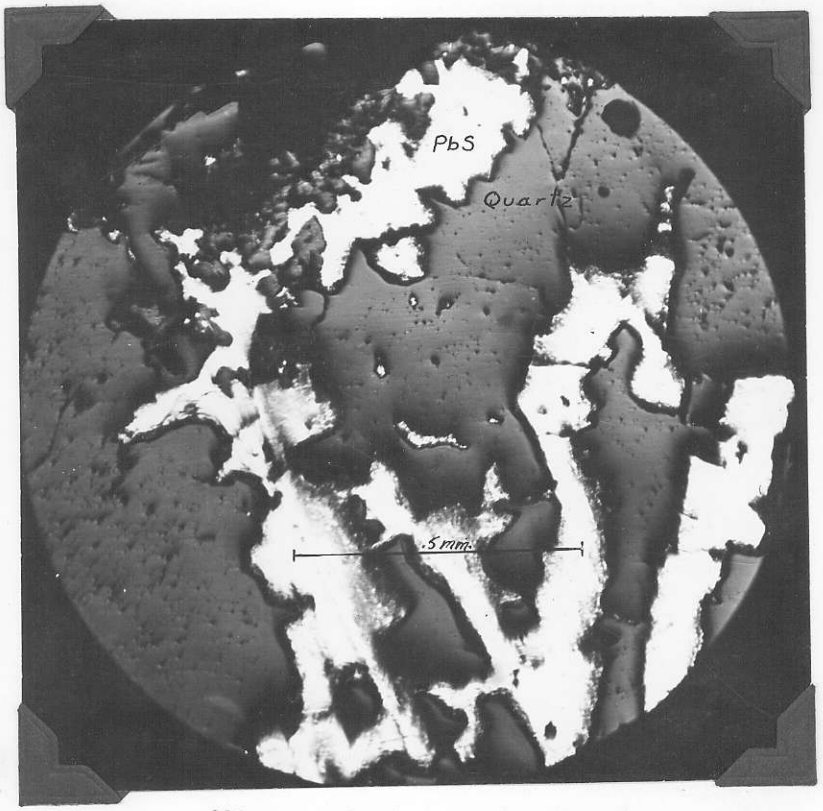


Sketch showing contacts of quartz chalcopyrite and galena.

X75

Sect. # 3





Micro-photograph showing

Galena replacing Quartz

X 75

Microscope:

Leitz- 337061

Ocular- 8X

Objective- No.3

Photo:

Exposure ½ secs.

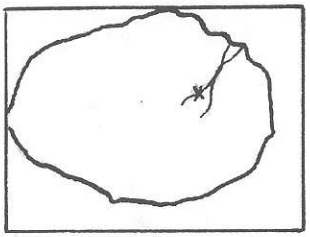
Camera- Busch Pressman

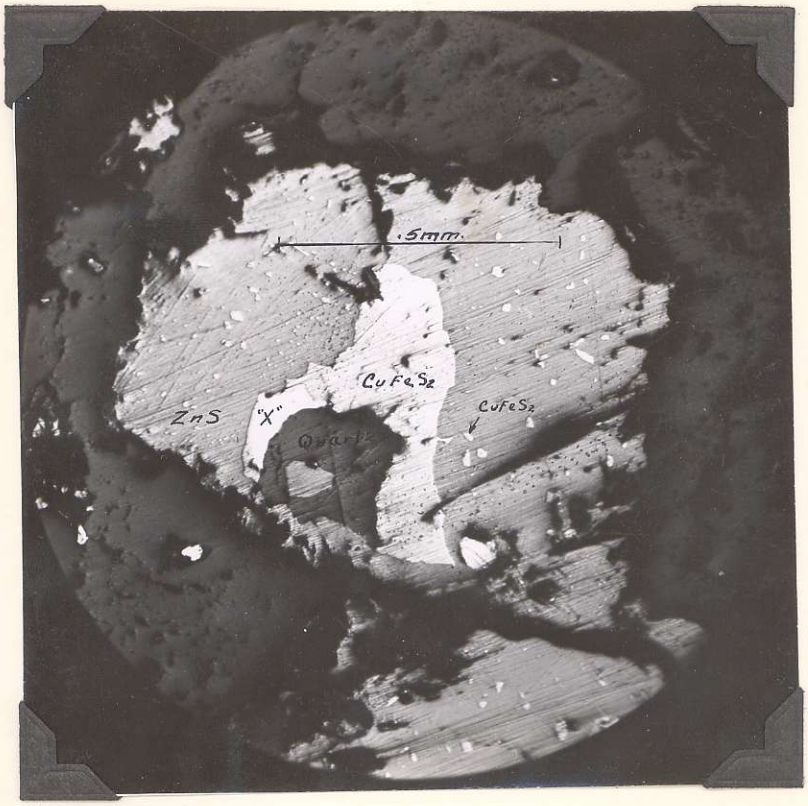
Photo by R. Steiner

Minerals shown in photo:

1. Galena
2. Quartz

Sect. # 1





Micro-photograph showing

Mineral "X"

X 75

Microscope:

Leitz- 337061

Ocular- 8X

Objective- No. 3

Photo:

Exposure $\frac{3}{5}$ secs.

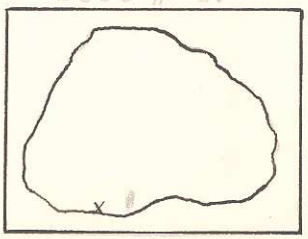
Camera- Busch Pressman

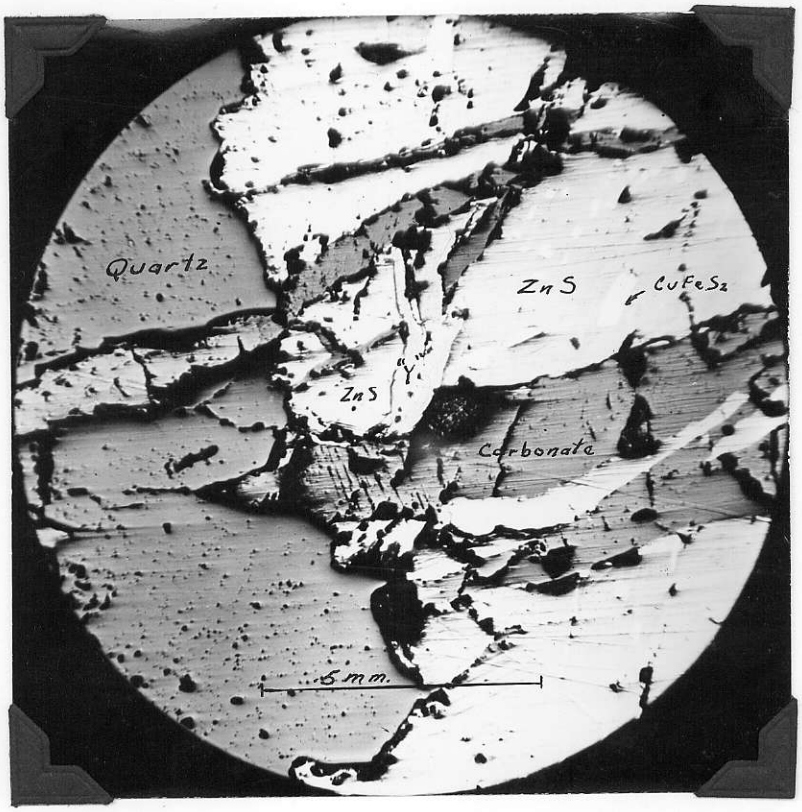
Photo by R. Steiner

Minerals shown in photo:

1. "X"
2. Chalcopyrite
3. Sphalerite
4. Quartz

Sect # 4.





Micro-photograph showing

Mineral "Y "

X 75

Microscope:

Leitz- 337061

Ocular- 8X

Objective- No. 8

Photo:

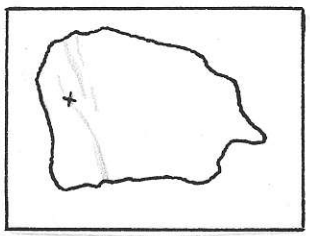
Exposure 3/10 secs.

Camera- Busch Pressman

Photo by R. Steiner

Minerals shown in photo:

1. "Y"
2. Sphalerite
3. Quartz
4. Carbonate



Sect. # 5