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Report on the Ore of The J. & L. Deposit

Geology 9

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Contents

The Microscopic Examination of the J. & L. Ore

Introduction

Location

The J. & L. group consists of five claims on the south side of the east fork of Carnes Creek about one-half mile above its intersection with the main creek. Carnes Creek flows southwesterly into the Columbia River at a point about twenty-four miles north of Revelstoke. Of this distance about sixteen miles is by auto road and eight miles by trail along the river. Just beyond the mouth of Carnes Creek a trail branches off to the east. It follows along the north bank of the creek, crosses the east fork and leads to the mine cabin, about 8 miles from the Columbia River. The workings lie on the south and west slopes of the spur separating the forks of Carnes Creek, and at elevations of 3000 to 4400 feet. The claims are owned by T. E. Arnold of Vancouver.

Development

This deposit was discovered about 1900 and soon the existence of a large orebody was proved. Numerous attempts have been made to recover the values but so far without success. At first the efforts were confined to attempting to produce a gold concentrate. This was impossible and efforts were then made to produce a concentrate acceptable at a smelter. This

also proved unsuccessful. A large number of tests have been conducted but in many of the cases were conducted for the purpose of adapting a certain process to the ore.

In 1941, tests carried out under the direction of Professor Forward in the Metallurgical Laboratories of the University of British Columbia have indicated a commercial method of extracting the gold, silver, zinc and copper from the ore. The commercial success of this method depends on the character and grade of the run-of-mine ore. It is not known from what section of the deposit the samples were picked.

The tonage of ore as estimated from the work already done is roughly 800,000 tons of ore having the following assay:

Au	0.39 oz/ton
Ag	5.7 oz/ton
Zn	8.8 per cent
Cu	0.4 "
As	11.0 "
Sb	0.3 "
Fe	25.0 "
S	25.0 "
SiO_2	16.0 "
CaO	5.0 "
Mo	Trace
W	"
Sn	"
Co	Nil
Ni	"

Geology

The general geology of the area in which the J & L group lies is given by H. C. Gunning in the Summary Report 1928, Geological Survey of Canada.

The rocks in the vicinity of the J & L deposit are chiefly schist and limestone with occasional bands of quartzite. The vein or mineralized zone occurs at or near a schist limestone contact that strikes 65 to 75 degrees west (magnetic) and dips 30 to 55 degrees to the north-east (into the hill). This contact has been traced at intervals by open cuts and trenches for several thousand feet up and across the hillside. The mineralized zone is not continuous throughout this distance. In places it reaches a width of 6 to 8 feet. The hanging wall consists of schist and the footwall of limestone. Gouge is present in many places. The ore is a fine-grained mixture of zinc blende, galena, arsenopyrite, pyrite, chalcopyrite, with minor amounts of quartz and calcite. The sulphides occur as veinlets, lenses or bunches occasionally as much as 3 feet wide, but usually not more than 12 to 16 inches. The vein matter has been extensively altered and decomposed by oxidation.

[1]The schist on the hanging wall of the vein is an altered quartzite sheared to sericite schist. Under the microscope it is seen to consist of quartz, pyrite in cubes, sericite and a little talc. The ore lies along a well defined shear zone, on the contact of marble and schist and has been formed in part by filling of the shear zone, and in part by replacement, particularly of the foot wall marble."

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1. H. C. Gunning, Geological Survey of Canada, 1928.

Mineralogy

Introduction

The specimens were obtained from a shipment of ore that was shipped to the university for metallurgical investigation. An effort was made to pick as many different types of ore as possible. Five specimens were mounted in Demar gum and polished. In polishing, it was found very difficult to get a surface free from relief due to the varying hardnesses of the constituents. Five specimens were mounted in bakelite and super polished. The choice of specimens for super polishing was unfortunate because on examination it was found they contained only the more abundant sulphides. However, considerable information was obtained from the hand polished sections.

Minerals

Ten minerals were identified in the ore examined. These are named in their order of abundance: arsenopyrite, pyrite, sphalerite, pyrrhotite, galena, chalcopyrite, covellite, anglesite, tetrahedrite and chalcocite. The gangue consists chiefly of quartz and calcite in varying proportions.

Paragenisis:

Arsenopyrite _____

Pyrite _____

Pyrrhotite _____

Fracturing

Calcite _____

Quartz _____

Fracturing

Chalcopyrite _____

Tetrahedrite _____

Sphalerite _____

Galena _____

Fracturing

Anglesite _____

Covellite _____

Chalcocite _____

The first minerals to be deposited were arsenopyrite, pyrite and pyrrhotite. After these had solidified there occurred a movement during which the minerals were fractured. The fractures were filled by a solution of calcite and quartz in varying proportions. This was followed by another period of movement in which the pyrite, arsenopyrite and gangue were fractured. The magma, containing sphalerite chalcopyrite, tetrahedrite and galena then came in and these minerals came out of the solution in the order indicated.

Again there was fracturing but this time very slight and the fissures were not filled. These open fissures probably aided in the alteration of some of the chalcopyrite and galena to covellite, chalcocite and anglesite.

Arsenopyrite occurs in both large and small grains, usually slightly oxidized. It has been subjected to intense fracturing and the fractures are filled with gangue. During the second period of fracturing the arsenopyrite was again broken and the fissures filled with the later sulphides, chiefly sphalerite and chalcopyrite. There is no sign of the arsenopyrite being fractured during the third period of movement.

The pyrite occurs chiefly in the form of grains surrounded by calcite and quartz (see Plate No.3) and also surrounded by the later sulphides. Originally it formed a fine grained mixture with the arsenopyrite in which there was no definite boundary between the two minerals (see Plate No.1).

Pyrrhotite, although relatively abundant in the hand specimens, is not present to any great extent in the sections. It occurs with both the arsenopyrite and pyrite but is not oxidized to any extent. (see Plate No.2). Arsenopyrite, pyrite and pyrrhotite are contemporaneous.

The gangue minerals consist of calcite and quartz in varying proportions. In some specimens the calcite occurred as rounded grains in quartz and in other specimens the quartz occurs as rounded grains in calcite. The mixture

veins and surrounds the arsenopyrite and pyrite and is therefore later.

Sphalerite is fairly abundant in the sections surrounding and veining the early sulphides. Chalcopyrite occurs as small blebs in the sphalerite and the galena. In turn, the chalcopyrite contains small areas of tetrahedrite. (see plates Nos. 7,8 and 9)

The age of the galena is not clear. There are numerous areas in which the galena appears to have come in with the sphalerite and segregated in small Y-shaped blebs on the cooling of the sphalerite. In other places the galena veins the sphalerite and there is no inclusion of galena in sphalerite. (se Plate No. 9). It appears that the sphalerite came in first, then sphalerite and galena and finally, when the source of sphalerite became exhausted, the galena came in alone.

At this time there appears to have been a third period of deformation. Small open fissures are numerous and appear to break along the edges of the pyrite and arsenopyrite grains rather than across them. (see Plate No. 12) As these cracks were too fine to be observed in the hand polished sections, their relation to the later sulphides is not known. The presence of these open cracks would account for the oxidation of the ore at considerable distance from the surface.

Covellite appears in sphalerite apparently replacing chalcopyrite (see Plate No. 10). There is a small amount of chalcopyrite intergrown with the covellite. (see Plate No.11)

The galena has been partly replaced by anglesite (see Plate No. 9).

Conclusion

Owing to the fact that it was not known from what section of the vein the ore was taken, it is impossible to form a definite opinion on the paragenisis of this ore. In the B. C. Department of Mines Report for 1922, the assays of a series of samples taken is recorded. These indicate that the gold values are associated with the arsenopyrite and are fairly constant. The zinc increases from 2 per cent in the upper workings to 30 per cent in the lower workings. This may be merely a coincidence or it may be an indication of a change in the nature of the ore body.

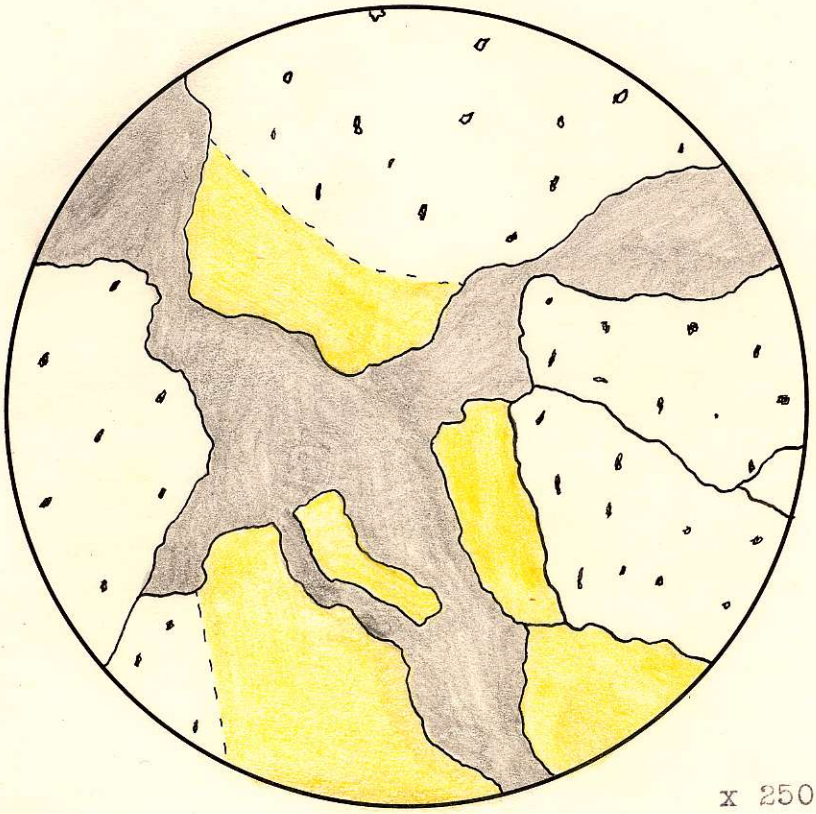
Due to the fact that the hanging wall is quartzite and the foot wall limestone, the nature of the commercial ore will vary across the vein. In places, the concentration of sulphides seems to occur with the quartz but this is far from definite.

To investigate thoroughly the paragenisis of this ore, it would be necessary to take a series of samples from different sections of the deposit and from different places across the vein. In this way a fairly accurate paragenisis could be obtained. It would also be advisable to find with which minerals the gold and silver values are associated. Thus the commercial possibilities of the deposit should be predicted with a fair accuracy. While studying the paragenisis

of this ore, the feeling persisted that the order of deposition was much more complex than this essay would indicate.

Illustrations

Plate No. 1



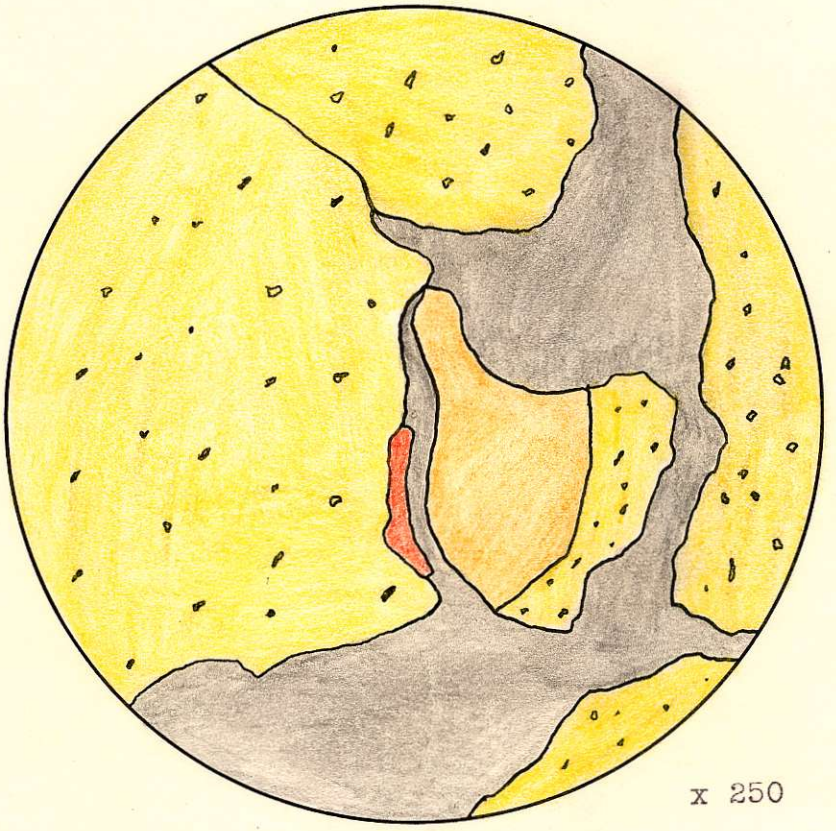
x 250

gangue

pyrite

arsenopyrite

Plate No.2



x 250

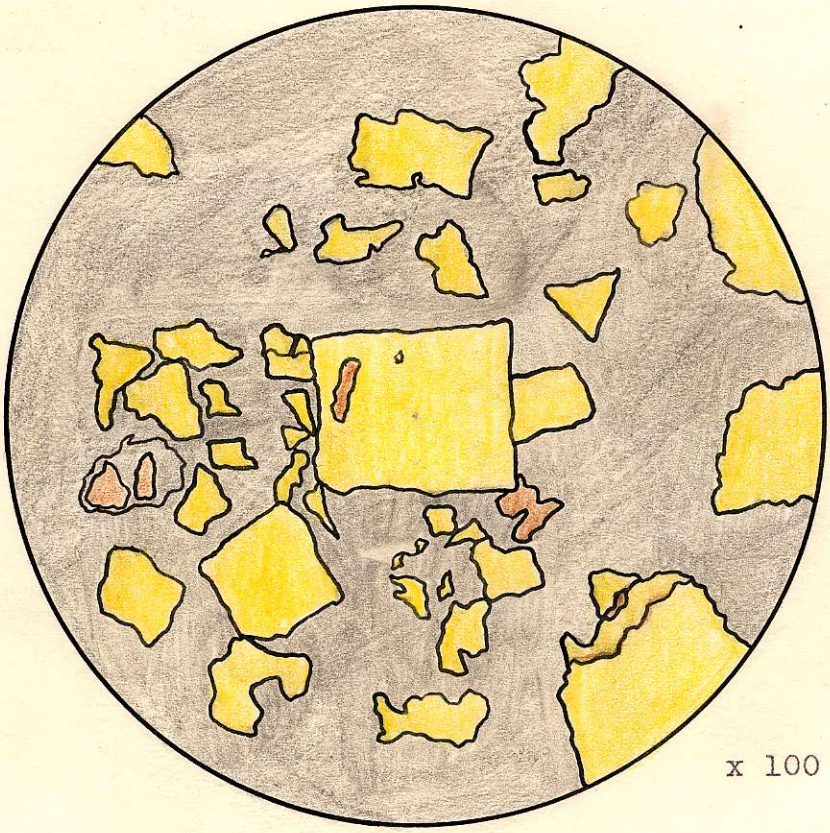
pyrite

gangue

pyrrhotite

chalcopyrite

Plate No. 3

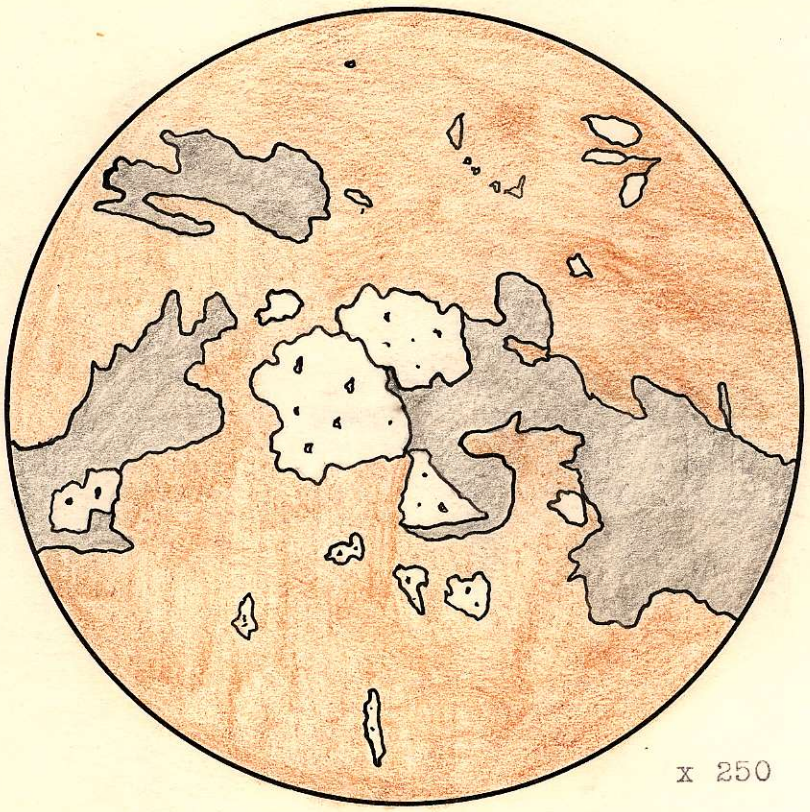


x 100

gangue

pyrite

sphalerite



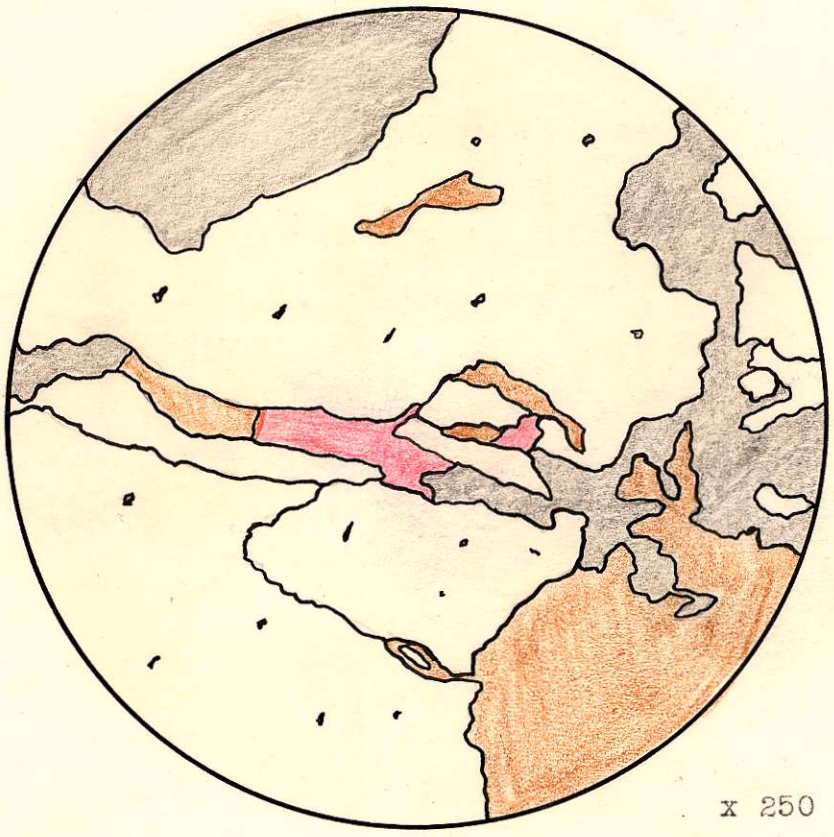
x 250

sphalerite

gangue

arsenopyrite

Plate No. 5



x 250

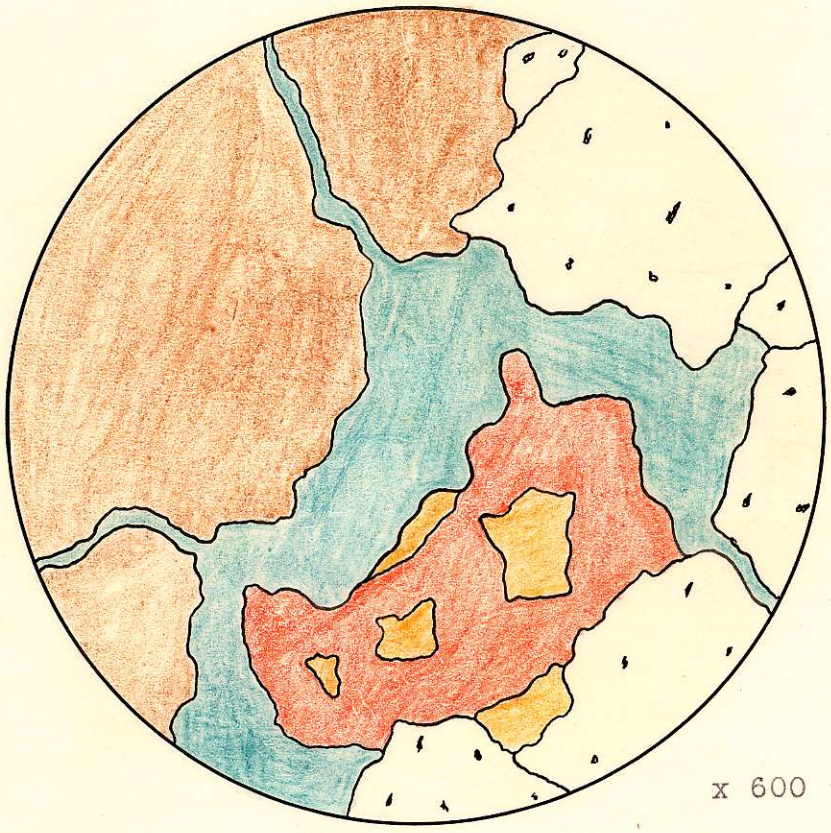
arsenopyrite

sphalerite

gangue

chalcopyrite

Plate No. 6



x 600

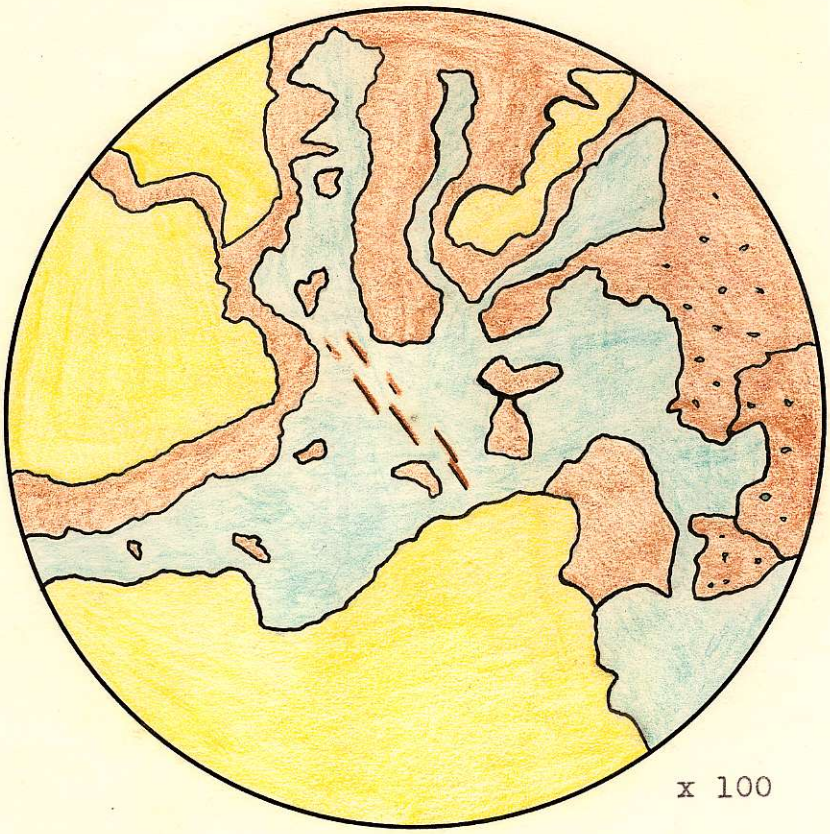
sphalerite

galena

chalcopyrite

arsenopyrite

tetrahedrite



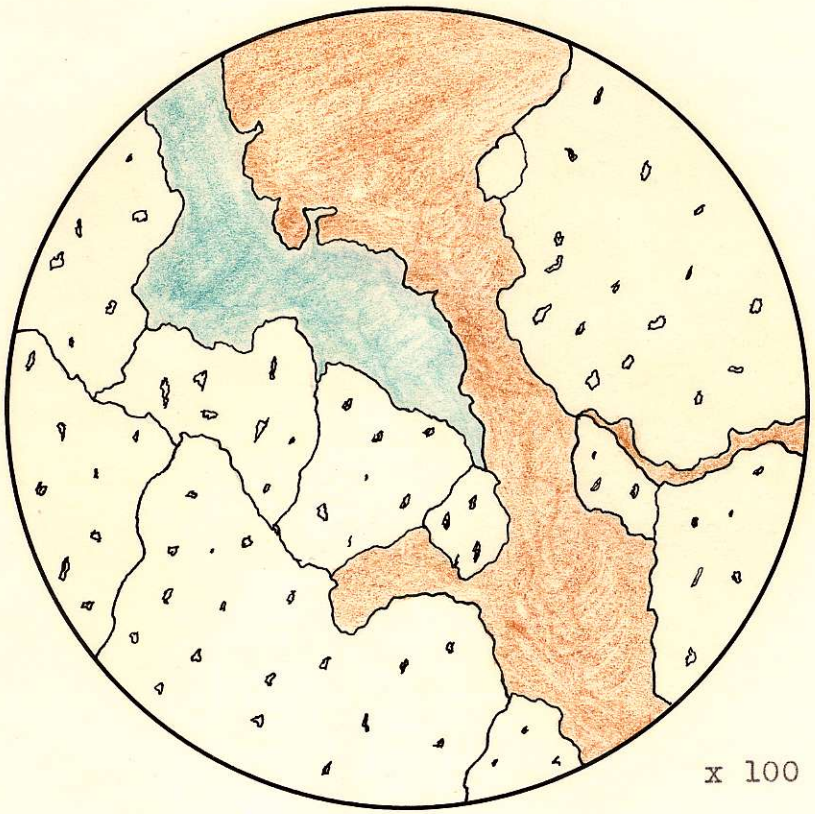
x 100

pyrite

sphalerite

galena

Plate No. 8



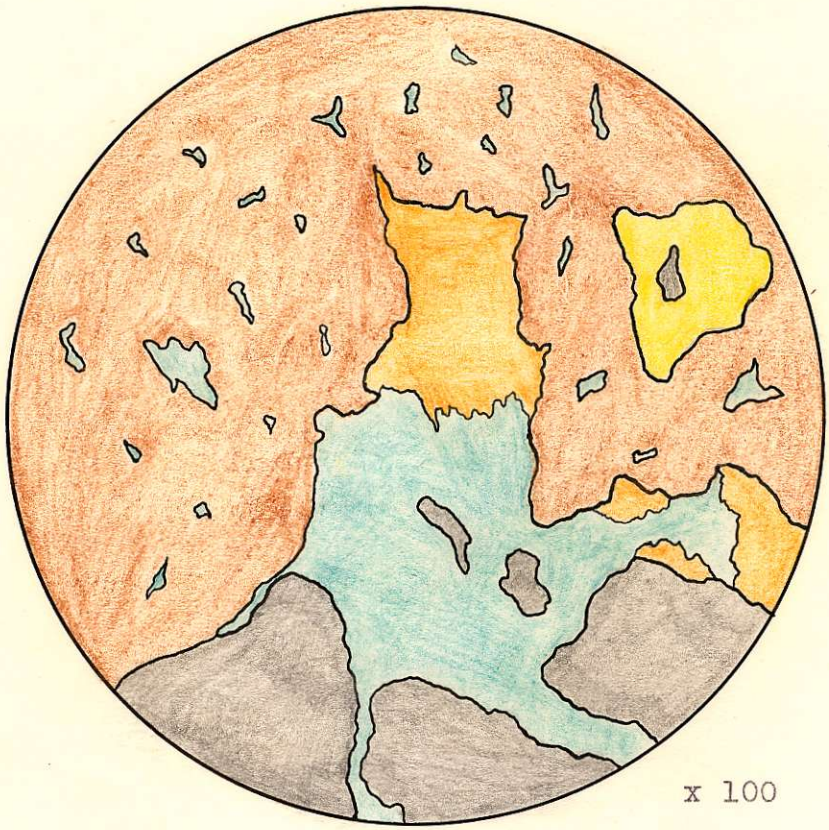
x 100

arsenopyrite

sphalerite

galena

Plate No. 9.



x 100

sphalerite

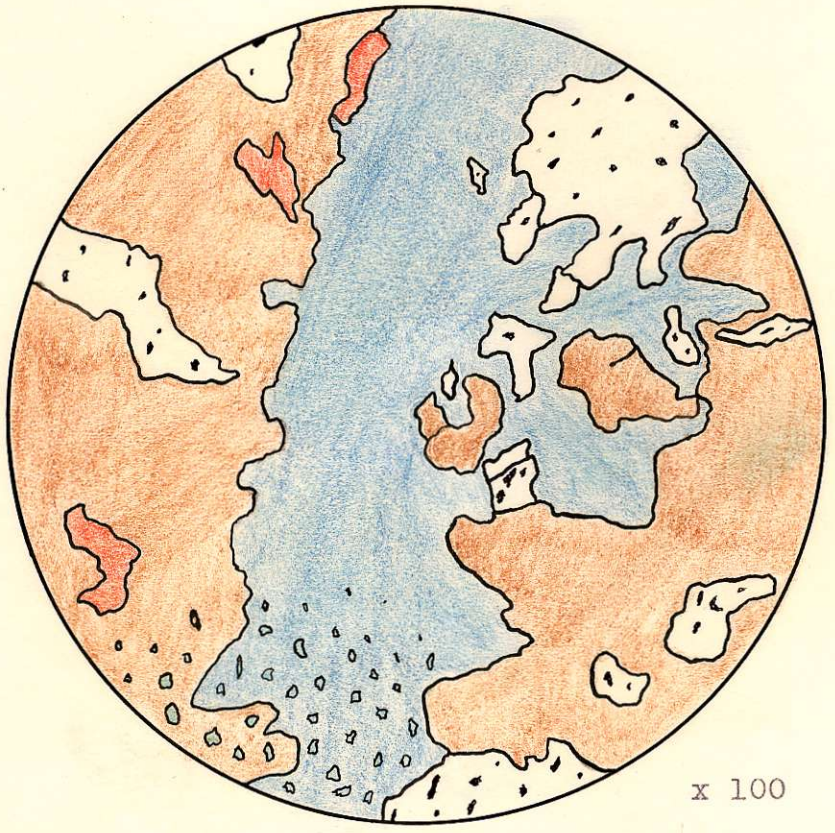
galena

gangue

anglesite

pyrite

Plate No. 10



x 100

covellite

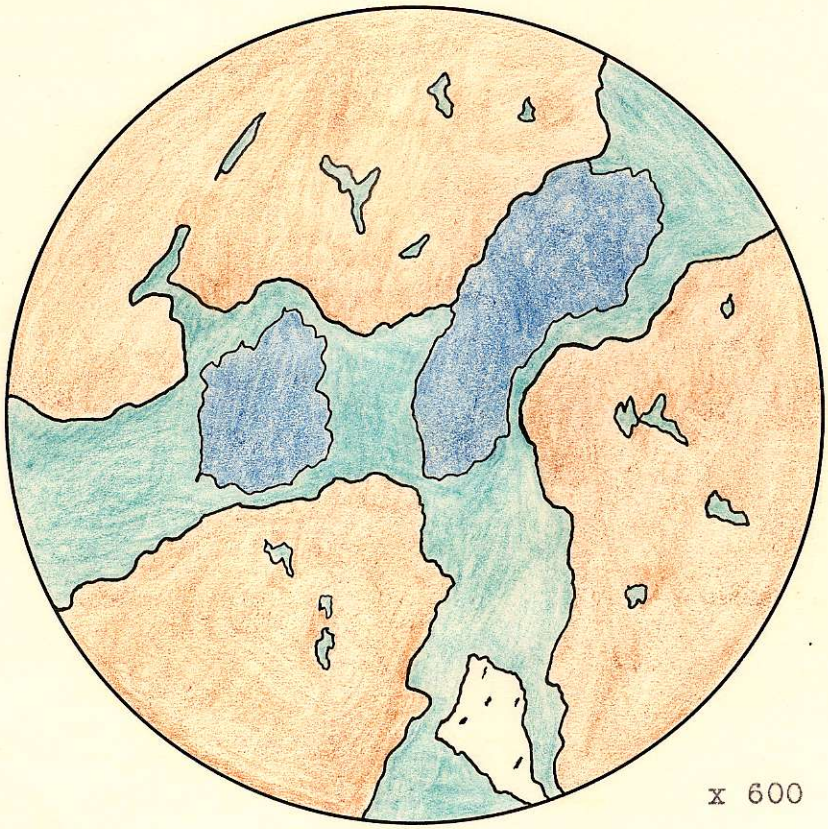
sphalerite

arsenopyrite

chalcopyrite

galena

Plate No. 11



x 600

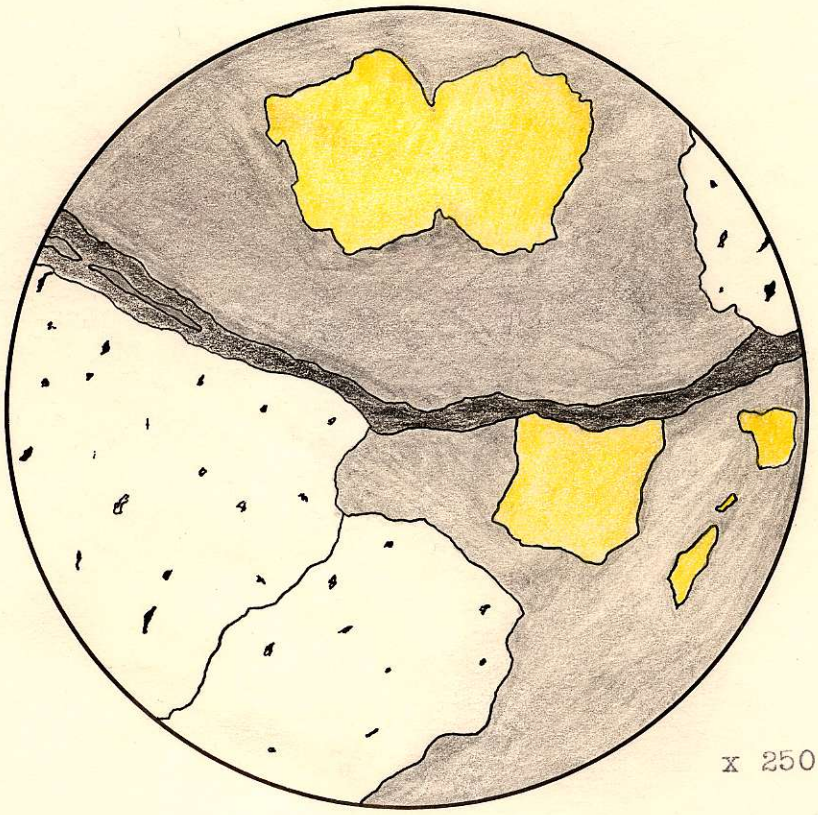
sphalerite

covellite

chalcocite

arsenopyrite

Plate No. 12.



x 250

gangue

arsenopyrite

pyrite

open fracture