Stearn

600395

GEOLOGY 409

MICROSCOPIC DETERMINATION OF ORE MINERALS

from Portland Canal, B. C.

Report No. 3

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MEGASCOPIC

Two specimens have been used for the study of this problem. One measuring 3.5" x 2.5" and, a smaller one, 1.5" x 1.5"; both being of irregular outline.

In general the colour of the section is dark grey due to considerable amount of dark carbonate gangue mineral and sphalerite. Yellow scattered fragments, which have been identified as pyrite, constitute the other distinctive colour. In addition small irregular scattered bluish-red spots are present, showing no preferred association to the above two minerals. This mineral gives and Indian-red streak and seems to point to ruby silver.

The specimens are fresh compact-like and do not exhibit any megascopic fracturing, signs of weathering or oxidation. On the polished surface sphalerite occurs in the form of irregular lumps as large as 1" across with finely disseminated but distinctly visible fragments of pyrite. Pyrite shows some well developed cubic crystal outlines, the majority, however, are irregularly rounded and appear as isolated islands in the surrounding, mainly sphaleritic, massive groundmass.

The following minerals have been identified on the basis of physical properties:

Sphalerite

Pyrite

Ruby silver

Carbonate (gangue)

MICROSCOPIC

The following minerals have been identified based on optical data, microchemical and etch tests:

Mineral #1 - Polish fair, colour gray, hardness C-, streak brownish, isotropic, nonpleochroic, fair internal reflection (yellowish brown). Occurs as coarse-grained masses showing tongue-like inclusions of arsenopyrite. (Fig. I). Identified as sphalerite.

Mineral #2 - Very good polish, tin white colour, hardness E, strongly anisotropic (bluish green, - brownish yellow), nonpleochroic, no internal reflection, cleavage or twinning. HNO_3 tarnishes brownish, all other reagents negative. Under medium power seen as irregular tongue-shaped forms in the surrounding sphalerite (Fig. I). Under high power good rhombic crystals averaging 4 microns are distinctly visible, being present in sphalerite, pyrargyrite, tetrahedrite. Identified as arsenopyrite.

Mineral #3 - Two kinds of polish, one poor pitted, the second showing good polish and somewhat brighter yellow colour. This can be explained possibly by the direction of cutting of individual crystals. If grain was cut parallel to "cleavage" it shows better polish and colour, if not it shows poor pitted and darker yellow colour. Hardness F, isotropic, nonpleochroic, no internal reflection, no cleavage. Negative to all reagents. Crystals are of cubic outline but not always of perfect euhedral form. On the average crystals measure 71 microns in size but considerable range can be observed. All often show fracturing. Pyrargyrite and sphalerite are common inhabitants of these fractures measuring up to one micron in size. Identified as pyrite.

Mineral #4 - Good polish, colour light greay with pinkish brown tint, hardness D, very brittle, streak black, isotropic, non pleochroic, in places faint brownish red internal reflection, under high power shows poor cleavage. Aqua regia stains pinkish brown, $FeCl_3$ gives very faint yellow irridescence, negative to all other reagents. The average grain size of the mineral is 105 microns. This mineral, under high power, shows rounded scattered island-like grains of pyrargyrite approximately 1.5 microns in size or even smaller. Small rhomb shaped grains of arsenopyrite 4 microns in size are not uncommon. Identified as tetrahedrite.

Mineral #5 - Good polish, bluish white colour, hardness C-, red streak, anisotropic (bluish gray-lighter bluish gray), somewhat pleochroic (?), in places red internal reflection, no cleavage, associated with sphalerite and tetrahedrite. $HgCl_2$ stains yellowish, KOH stains irridescent brownish blue, KCN quickly stains grayish brown, HNO_3 and HCl negative, aqua regia stains deeper blue. Microchemical tests indicate presence of Sb and Ag. Grain size varies from 315 microns, being the largest, to 1 micron, appearing in fractured pyrite. Seems to be replaced by tetrahedrite. Identified as pyrargyrite.

Mineral #6 - Polish good but shows scratches, colour yellowish white to golden yellow, hardness B, sectile, isotropic (somewhat greenish), nonpleochroic, no internal reflection or cleavage. $HgCl_2$, KOH, $FeCl_3$, HNO_3, HCl negative. Aqua regia stains brown and in some grains shows rim texture (Fig. II). Microchemical tests indicate strong Au and Ag presence. Yellowish white grains have been identified as electrum, golden yellow grains as gold. These two minerals are grouped together because the distinction between

them is not always clear-cut. In some instances distinctive electrum identification is possible especially when the grains are large enough (Fig.II) in others this can not be done, particularly if the two occur as small inclusions in sphalerite and tetrahedrite, measuring only a fraction of a micron in size. Possibility of some of these very small blebs being chalcopyrite produced by exsolution in sphalerite is very strong. However, due to their size minuteness and Cu presence in sphalerite and tetrahedrite microchemical tests could not be used. What appeared to be anisotropism under high power of some of these grains is not adequate proof for definite committal. Etching was not successful either, for the same reason - smallness of the grains.

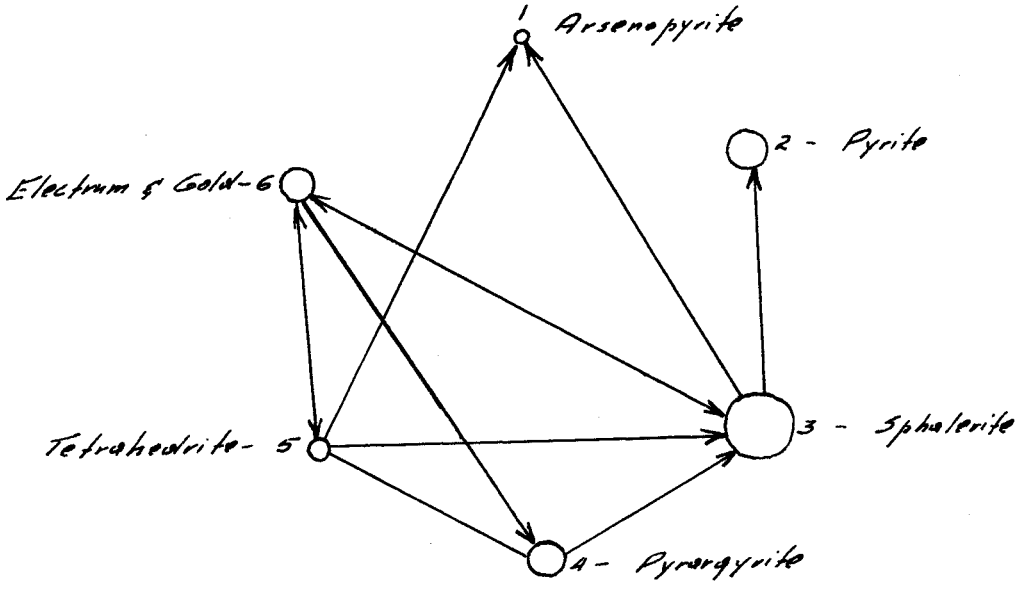
Sphalerite	10%
Pyrite	5%
Pyrargyrite	4%
Electrum) Gold) Chalcopyrite (?))	3%
Tetrahedrite	2%
Arsenopyrite	1%
Gangue	75%
	100%

Texture and Paragenesis

The specimens do not show any significant textures. The grains of all minerals are of irregular shape, showing agglomeration-like characteristic. The only texture of importance is the rim texture developed by etching (aqua regia) on some of the grains of electrum-gold, which has already been mentioned and illustrated in Fig. II.

Paragenetic sequence of the minerals cannot be established with definite proof because evidence is meager. However, highly suggestive order of deposition and replacement seems to be as below, with some possible over-lapping.

Presence of such minerals as pyrargyrite, tetrahedrite, pyrite, sphalerite implies that the temperature at which minerals crystallized was that of pyrargyrite (below 250°C) and that of the others (below 500°C) and suggests Mesothermal-Hypothermal type of deposit.



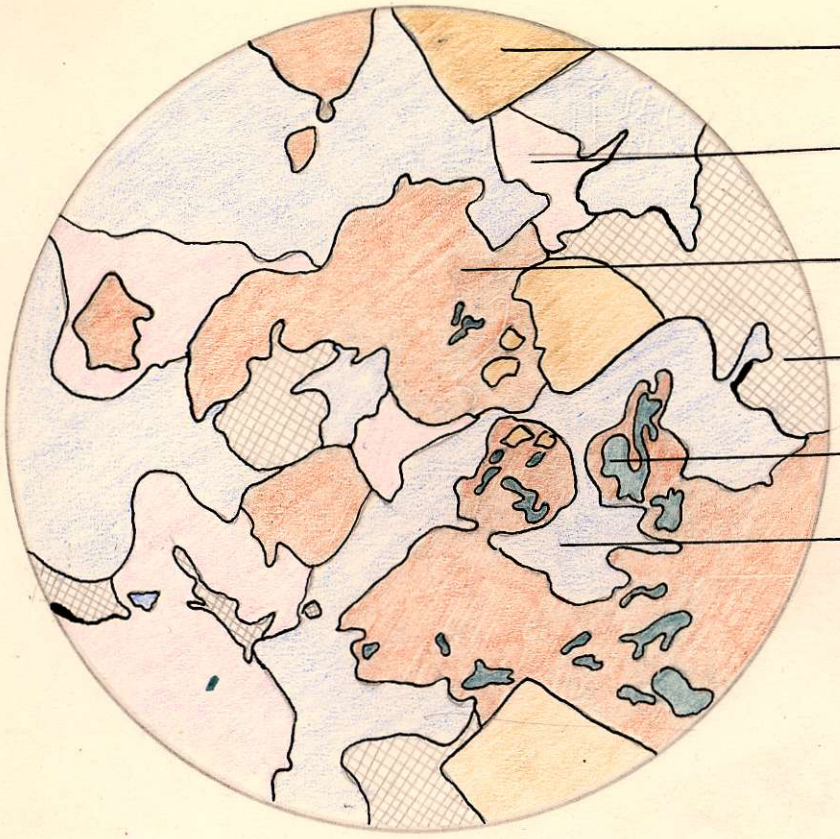


FIG. I

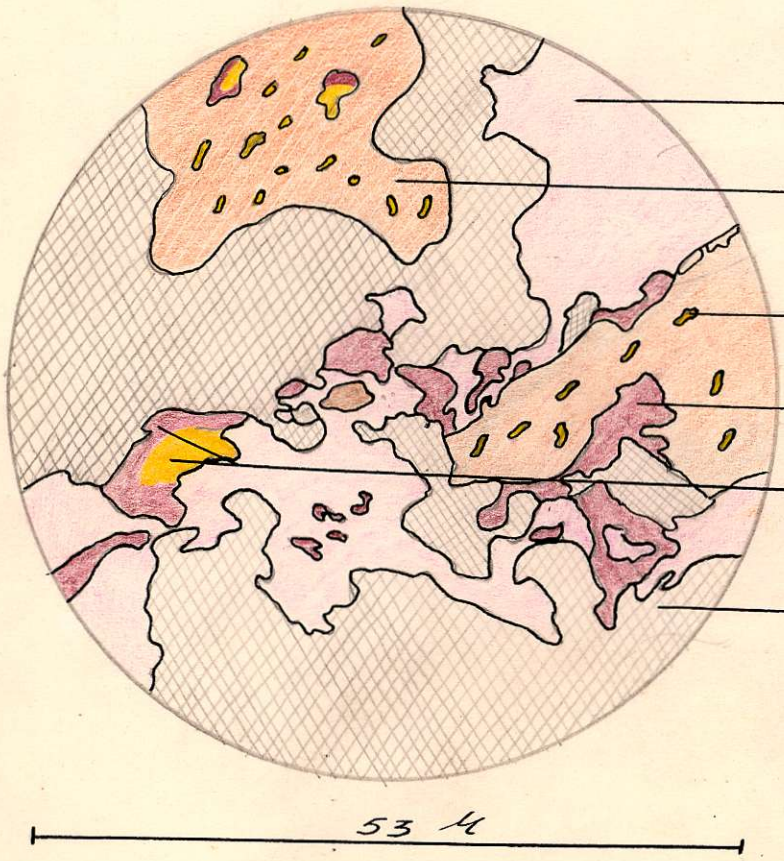


FIG. II.

Nipissing

R.M.T.

Feb. 22/51

This ore brought out by the pound.