SILVER STANDARD SUITE

GEOLOGY 407

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THE SILVER STANDARD SUITE

The Silver Standard Mine is situated on the western slope of Glen Mountain, approximately five miles north of Hazelton in the Omineca Mining Division of British Columbia.

Glen Mountain is composed of gently folded sedimentary rocks of the Hazelton group of Upper Jurassic or Lower Cretaceous age. These sedimentary rocks, ranging from thick-bedded, coarse, grey, impure sandstone and greywacke to finely laminated, grey to green argillite and siltstone have been intruded by two stocks of porphyritic granodiorite. The ore is found in veins cutting both the sedimentary and "granitic" country rock of the area. The main valuable constituents of the ore are gold, silver, lead, zinc and cadmium.

The Silver Standard Suite consists of seven polished sections and six hand specimens from various locations within the mine workings.

MEGASCOPIC EXAMINATION

Number 4 Vein - S. Drift - 1,300 foot level

There is one hand specimen and one polished section from this location. The hand specimen is a mass of fractured greyish "carbonate" rock with milky quartz, rosinjack sphalerite, galena and minor tetrahedrite and chalcopyrite mineralization in the fractures and apparently replacing the country rock. Approximately 25% metallics and 75% gangue. A sample from 1304 S. Drift contains similar mineralization.

Number 6 Vein - 1400 Stope and Sample #7

Both samples consist of massive sulphides. The sample from #6 vein consists of massive coarse grained galena with small fragments of sphalerite (approximately 10%) which appear to have been replaced by the galena. Sample #7 is similar in composition, containing approximately 20% sphalerite.

1306 South Drift

One hand specimen and one polished section. The hand specimen is composed of sphalerite, galena, tetrahedrite and chalcopyrite in a gangue of coarsely crystalline siderite, milky quartz and grey coloured carbonate wall rock. Some vugs and open fractures show well developed crystal faces of pyrite, sphalerite, galena and siderite.

Sample #34

This sample consists entirely of metallics - no gangue. The mineralization consists of approximately equal amounts of coarsely crystalline galena and tetrahedrite and a small amount ($\approx$ 1%) of chalcopyrite.

MICROSCOPIC EXAMINATION

Section #7 and Section #6 vein - 1400 stope were found to contain similar mineralization. Both contained galena with minor amounts of exsolved tetrahedrite, and sphalerite with small amounts of exsolved chalcopyrite. The galena was found to be replacing the sphalerite. Section #4 vein - South Drift - 1300 Level contained approximately 15% sphalerite with a minor amount of exsolved chalcopyrite, approximately 10% galena which contained a small amount of exsolved tetrahedrite; 1% tetrahedrite and $<$ 1% bournonite, which appeared to form a reaction rim around the tetrahedrite (see Figure 1). This section also contained a few relic pyrite crystals partly replaced by sphalerite.

The section from 1306 South Drift contained similar mineralization to that described for Section #4 vein, but in addition contained numerous arsenopyrite crystals, some partially replaced by sphalerite and tetrahedrite.

Section #34 was found to contain galena, tetrahedrite and a minor amount of chalcopyrite and pyrite. Pyrite ($\approx$ 1%) has been replaced by galena, tetrahedrite and chalcopyrite. The chalcopyrite was found to replace galena and tetrahedrite.

MINERAL PERCENTAGES

The percentage of ore to gangue and also the various percentages of the ore minerals in each of the specimens studied varies so widely that I beileve it is pointless to state the average composition of the suite. The general trend, in decreasing order of abundance is as follows:-

1. Galena
2. Sphalerite
3. Tetrahedrite
4. Chalcopyrite
5. Pyrite
6. Arsenopyrite
7. Bournonite

IDENTIFICATION OF MINERALS

The following minerals were identified by optical and micro-chemical means:-

1. Arsenopyrite -

   Hardness - very hard.
   Colour - silvery grey.
   Anisotropism - strong (colours blue, green, brown).
   Diamond shaped crystals.

2. Pyrite -

   Hardness - very hard.
   Colour - Brassy yellow.
   Isotropic.
   Cubes and relic cubes.

3. Sphalerite -

   Hardness - moderate - > galena.
   Colour - grey.
   Isotropic.
   Orange to reddish internal reflection.

4. Tetrahedrite -

   Hardness - moderate - > galena.
   Colour - olive grey.
   Isotropic.
   Good polish.
   Association with galena.

5. Bournonite -

Hardness - moderate > galena < sphalerite.
Colour - Bluish white (bluish tint).
Anisotropic - blue, yellow and tan colours.
HNO_3 - stains brown.
Other reagent - negative.
Occurs as a reaction rim between galena and tetrahedrite.

6. Galena -

Hardness - moderate.
Colour - white.
Isotropic.
Cleavabe pits (i.e. triangular pits).

7. Chalcopyrite -

Hardness - moderate.
Colour - bright yellow.
Weak anisotropism.
Associated minerals.

PARAGENESIS

The paragenetic sequence as determined from the polished section is shown on the Van der Veen Diagram on the following page.

There were probably several periods of deposition.

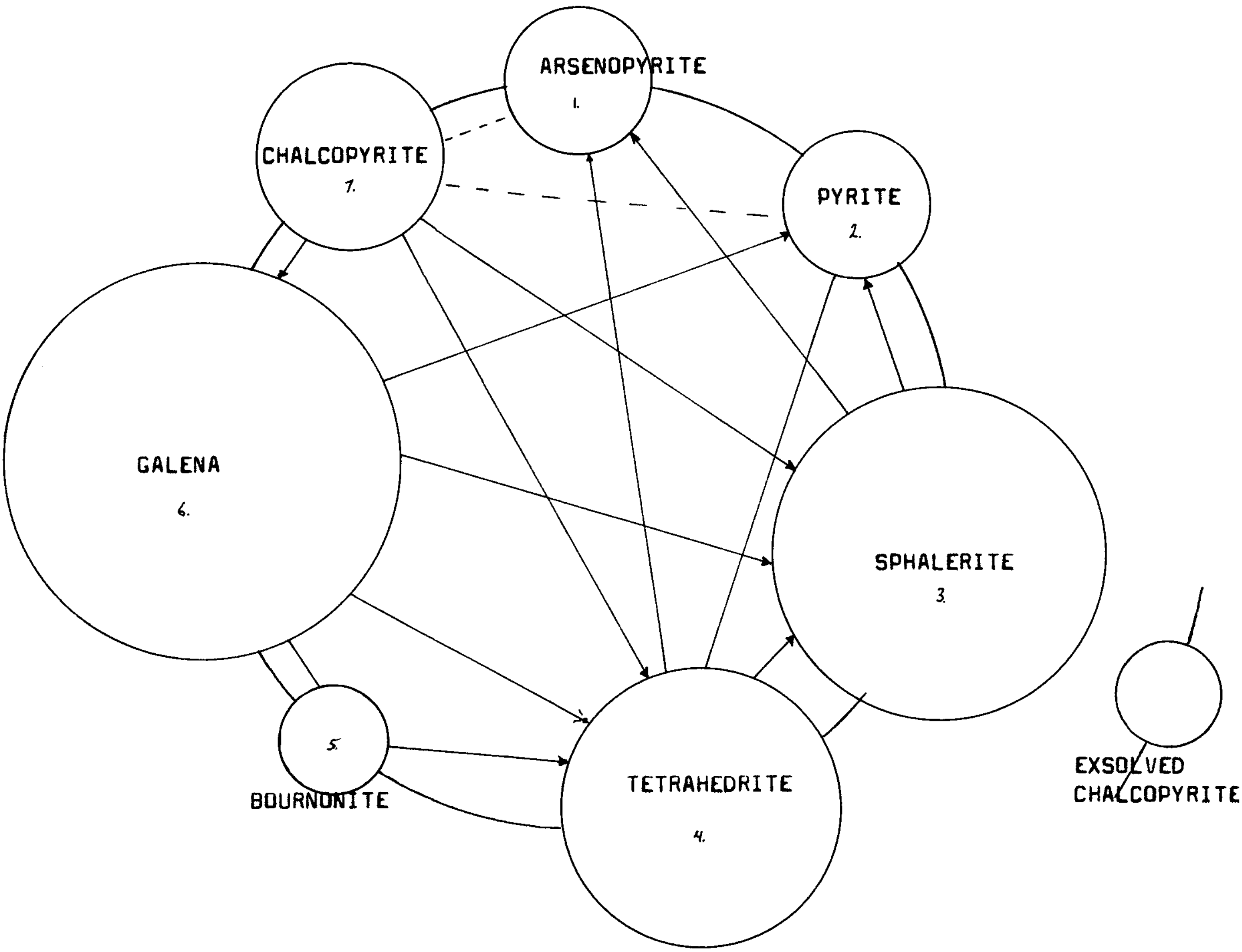
(i) Deposition of arsenopyrite, pyrite and some quartz and accompanying wall rock alteration.

(ii) Deposition of sphalerite and tetrahedrite and gangue minerals; quartz and siderite.

(iii) A change in the composition of the hydrothermal solution and the deposition of galena and the formation of bournonite reaction rims.

(iv) Chalcopyrite deposited after galena with replacement of galena, sphalerite and tetrahedrite.

VAN DER VEEN DIAGRAM FOR THE SILVER STANDARD SUITE

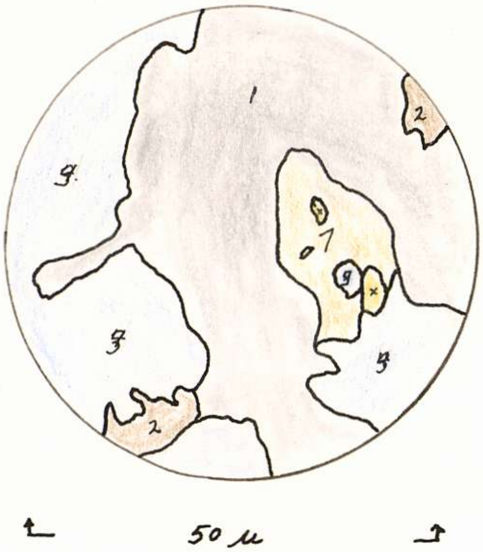


TEMPERATURE OF FORMATION

The presence of arsenopyrite and pyrite normally indicate a mesothermal or even a hypothermal environment, but the presence of many vugs in some of the specimens viewed and the high degree of wall rock alteration (chlorite in wall rock) indicate a mesothermal to epithermal environment.

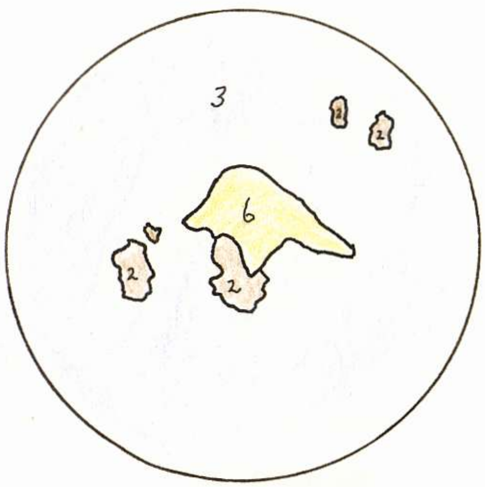
SIGNIFICANT TEXTURES FOR DETERMINATION OF PARAGENESIS

FIGURE 1



A reaction rim of bournonite (7) between tetrahedrite (3) and galena (1). Also shown is second generation sphalerite (4) and primary sphalerite (2) that has been partly replaced by tetrahedrite and galena.

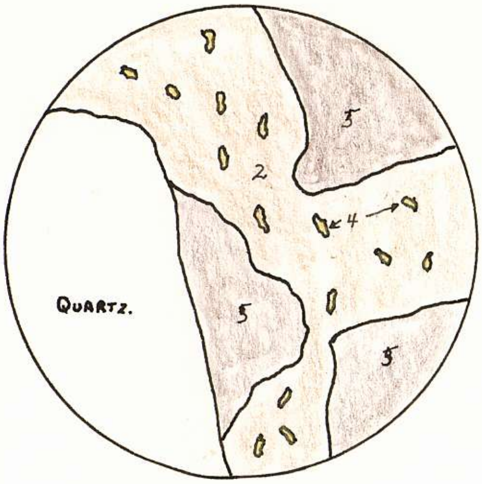
FIGURE 2



Sphalerite (2) replacing the edges of an arsenopyrite crystal (6).

Tetrahedrite (3) has replaced sphalerite preferentially.

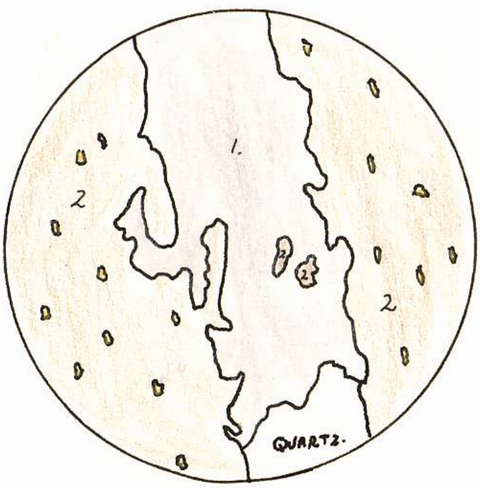
FIGURE 3



Sphalerite (2) replacing pyrite (5) along a contact between quartz and pyrite.

Chalcopyrite (4) is exsolved along cleavage directions of sphalerite.

FIGURE 4



Quartz and galena (1) replacing sphalerite (2) along a fracture. It is probable that the quartz is earlier than the galena and is being preferentially replaced by the galena. Chalcopyrite (4) blebs are exsolved along the cleavage direction of the sphalerite.