MINERALOGY

OF THE

HEDLEY MONARCH PROPERTY.

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Submitted in

Geology 409

University of British Columbia

April 14, 1949

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INTRODUCTION

The following is a report on the examination of samples of an ore from the Hedley Monarch property. The purpose of examination was to determine the minerals present in the ore, the paragenesis of these minerals, the manner of their occurrence and their association. This was accomplished by both a megascopic examination of the ores and study of polished sections under the microscope.

LOCATION OF HEDLEY MONARCH PROPERTY

The Hedley Monarch Property is in the Osoyoos Mining Division. The holdings, 72 claims or fractions, extend from the village of Olalla, 1½ miles west, ¾ miles east, and 2 miles south. The largest nearby town is Keremeos, 4 miles south of Olalla. The property is thus situated at 49°15' north latitude and 119°50' west longitude.

ACKNOWLEDGMENTS

The author is indebted to Dr. R.M. Thompson for confirming the identity of some of the minerals by X-ray and to Dr. H. V. Warren and Mr. J. Fyles, for their assistance in

this project.

GEOLOGY OF THE AREA

The general geology of the region is shown on map 628A of Geological Survey of Canada. A sedimentary series with intercalated greenstone is intruded by pyroxenite, syenite , and granite. The sediments are found mainly in the south part of the Hedley Monarch property and granitic intrusives in the central and north parts. Distinct types of mineralization are found in four different parts of the property but the ores are believed to be from the Sweetener Vein which is in the Sunrise section. The quartz veins of the Sunrise section occur in a small stock of syenite, soda granite, and aplite, bounded on 3 sides by pyroxenite. The veins are narrow, strike westerly, and stand nearly vertical and have not been traced to the contact of the stock and the enclosing pyroxenite. A sheeted zone of syenite, called the Shepherd Vein, dipping 75° northerly, striking S70°W contains stringers of white quartz. North of this and diverging from it at an angle of 25° is the mineralized Sweetener Vein of white quartz, ¼ inch to 1 inch wide.

MEGASCOPIC EXAMINATION

The samples consist of veins of white quartz from 1/8 inch to ¼ inches thick in pink syenite. Where the syenite could be broken away from the quartz, a thin layer of a green gangue mineral was found. In this green zone were found finely disseminated crystals of pyrite and patches of pyrite and chalcopyrite. In some places these contacts were black and when scratched gave either a black or a reddish brown streak. Where the quartz was fractured the chalcopyrite and pyrite were found filling the cracks often accompanied by an unidentified black mineral. Irregular patches of a black mineral with a reddish brown streak, probably tetrahedrite, occurred in the quartz. The mineralization persists into the syenite but in it is much more finely divided and scattered except close to the contact. Fractured surfaces of the quartz appeared to have cleavage which, on testing for hardness, proved to be thin layers of a relatively soft mineral, probably calcite.

MICROSCOPIC EXAMINATION

SPECIMEN 1.

This specimen consists mostly of quartz with pyrite cubes scattered through it. Several patches of chalcopyrite occur with pyrite crystals within it. A veinlet of calcite cuts through the quartz and chalcopyrite. One group of small irregular patches of galena occurs.

SPECIMEN 2.

The gangue consists principally of white to grey quartz contacting the pink syenite. The pyrite mineralization is the more intense at this contact. Much tetrahedrite occurs, some of it in contact with a galena with mutual boundaries. Free gold was found in several of the tetrahedrite grains but not in the galena. However, one of the patches of tetrahedrite was veined by galena and the gold was in contact with it, in one case as a bleb at the end of a vein of galena, in another, as a small vein running up to the galena. In one place the tetrahedrite appears to be replacing both pyrite and chalcopyrite(Fig.2).

SPECIMEN 3.

The principal metallic mineral is chalcopyrite which occurs as blebs along one side and scattered along fractures in white to grey quartz. Pyrite is present as disseminated crystals and is concentrated along the side of the vein. Tetrahedrite occurs in minor quantities. The single telluride, hessite, Ag_2Te, found, occurs in this section in chalcopyrite(Fig.8). Hessite was identified by its anistropism and etch tests. In this same area chalcopyrite has also partially replaced a cube of pyrite. In this section the chalcopyrite appears to be associated with stringers of calcite in fractures in the quartz.

SPECIMEN 4.

As well as minor tetrahedrite, galena, pyrite, and several small patches of chalcopyrite, a large horseshoe-shaped area of chalcopyrite about 4mm. wide occurs. At one end of the "horseshoe" the chalcopyrite is seen to be replacing crystals of pyrite. A number of specks of a grey mineral are found disseminated through the chalcopyrite. These are too small to identify definitely, but have the same etch reactions as tetrahedrite.

SPECIMEN 5.

Chalcopyrite, pyrite, and tetrahedrite are present but the most interesting mineral found in this specimen is scheelite. This mineral was first detected by the ultra-violet lamp and its identity proven by scratching with a knife through a drop of HCl on the mineral. The blue stain in the scratch was quite noticeable. Scheelite is associated with quartz, calcite, and chalcopyrite. The contacts between these various minerals is quite irregular making it difficult to determine their age relationship. The scheelite was probably deposited first, followed by quartz, calcite, and chalcopyrite.

SPECIMEN 6.

A $\frac{3}{4}$ inch quartz vein separates two areas of syenite. The quartz is finely fractured, is white to grey, accompanied by a green gangue mineral and calcite. It is not highly mineralized but does have two patches of galena. In one of these patches the galena is in contact with pyrite but with a straight boundary, hence nothing can be inferred of the age relationship. Small crystals of pyrite occur in the quartz near the contact with the syenite and in the syenite itself.

SPECIMEN 7.

Most of this specimen is syenite with a grey to white quartz vein, from 1 to 4 mm. thick, running through it. Both the syenite and quartz have been fractured and calcite has been introduced into the fissures. The principal mineral in the quartz is chalcopyrite, which continuously mineralizes irregular fissures for about half the length of the section. A short veinlet of chalcopyrite also occurs in a fracture in the syenite about ½ cm. from the quartz. Pyrite is present as disseminated crystals but most of it is in the syenite. The contact of the quartz and syenite shows a thin black band in places, but no black mineral was identified from it. An interesting feature is the partial replacement of one of the pyrite cubes in the vein by quartz. This crystal apparently is not broken. This perhaps indicates two periods of quartz deposition.

SPECIMEN 8.

The gangue is white to pink and has been badly fractured. Some calcite is present and the surface is vuggy. The chief metallic mineral is pyrite which occurs as scattered crystals which are more numerous in the pink area. Some of the cubes of pyrite have been shattered by shearing.

MINERALS PRESENT IN ORDER OF ABUNDANCE

Pyrite.

FeS_2. This occurs in all sections in varying amounts and in all cases in the form of disseminated cubes ½mm. or less in size. It is associated with tetrahedrite and chalcopyrite, being older than both of these.

Chalcopyrite.

($CuFeS_2$) This occurs as irregular blebs along fractures usually associated with calcite. It replaces the pyrite and scheelite and is itself replaced by tetrahedrite. In one place it contains hessite.

Tetrahedrite.

($3Cu_2S\ Sb_2\ S_3$) This mineral occurs along fractures in blebs up to 2mm. long and is probably contemporaneous with the galena and is the host of the gold which occurs as particles or veinlets in it, sometimes in contact with galena.

Scheelite

($CaWO_4$)Scheelite was definitely recognized only in specimen 5 where it occurs as grains up to 2 mm. in width. However, ultra-violet light caused fluorescence in scattered areas of several of the other specimens, indicating a relatively widespread occurrence. It fluoresces blue and appears to be older than the minerals in contact with it.

Galena.

(PbS) Where this mineral occurs with tetrahedrite, it has mutual boundaries or veins the tetrahedrite, and so may be contemporaneous. The largest area is 1.5mm in width. Although no gold was observed in it, it was in contact with the gold in the tetrahedrite in two places in specimen 2 (Fig 1, Fig 3). The galena shown in Fig 1. was too small to identify definitely but had the same etch reactions as that of Fig 3. which was positively identified.

Gold.

This occurs in tetrahedrite as blebs or veins (Fig 1, Fig 3) and was observed only when the tetrahedrite was associated with galena. The blebs were up to 30 μ in width and the vein was approximately 60 μ in length. Assays across 2 inches of this ore, including ½ inch of wall rock on either side, have shown a value of 1.61 oz. of gold per ton.[2] (p.A129)

Hessite.

Ag_2Te. This mineral was found in only one specimen, associated with chalcopyrite (Fig.8). It is probably the source of the silver which, assays show, varies from less than 1 oz. to over 12 ozs. per ton.[2] (p.A129)

Paragenesis.

The order and range of deposition is believed to be as follows:

Pyrite

Scheelite

Quartz

Calcite

Chalcopyrite

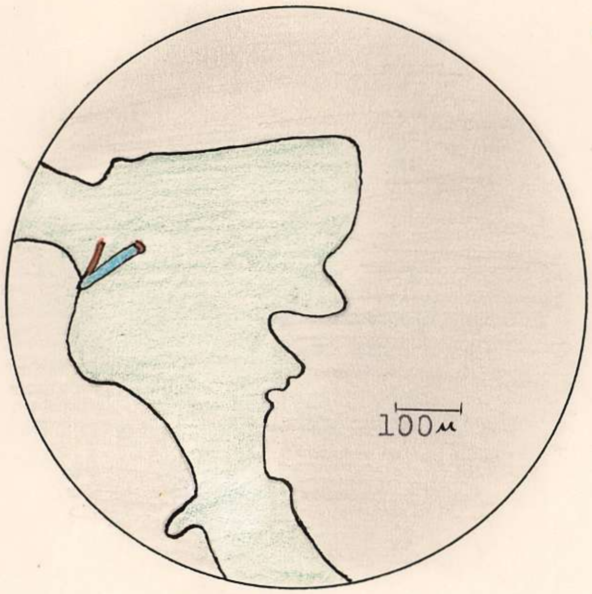
Hessite

Tetrahedrite

Galena

Gold

Fracturing occurred between the deposition of the quartz and calcite which in most cases did not affect the pyrite. The chalcopyrite and calcite seem usually to be closely associated with this fracturing.



Specimen 2

Orange-Gold

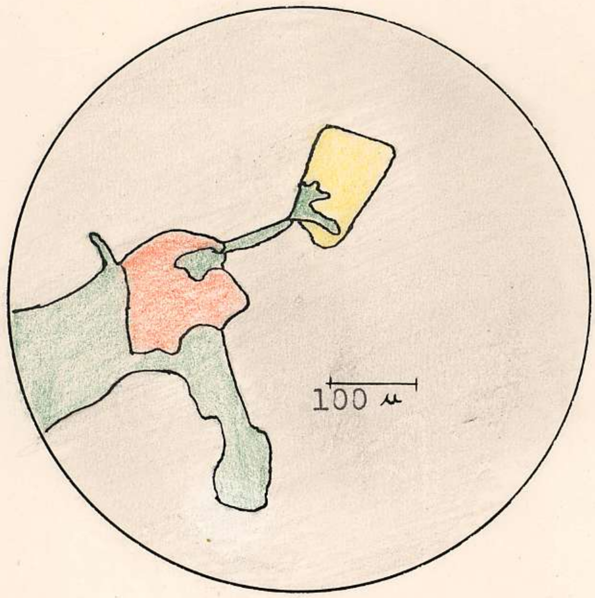
Blue---Galena

Green--Tetrahedrite

Grey---Quartz

Galena associated with gold in tetrahedrite

Figure 1



Specimen 2

Orange-Chalcopyrite

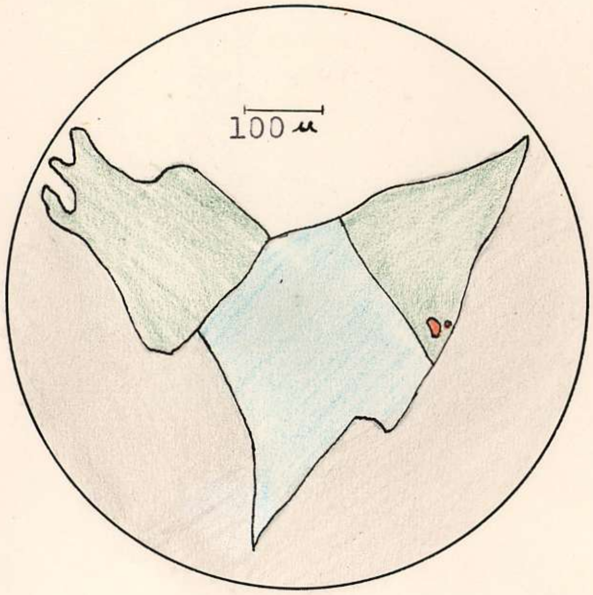
Green--Tetrahedrite

Yellow-Pyrite

Grey---Quartz

Tetrahedrite associated with chalcopyrite and pyrite

Figure 2



Specimen 2

Orange-Gold

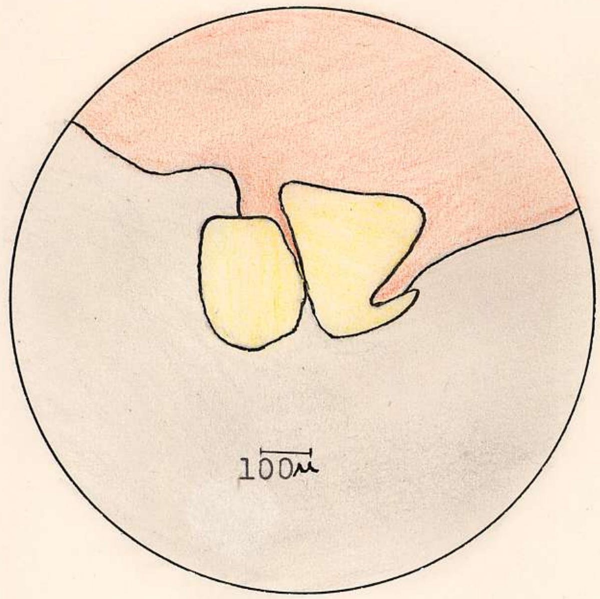
Green--Tetrahedrite

Blue---Galena

Grey---Quartz

Galena showing mutual boundaries with tetrahedrite containing gold

Figure 3



Specimen 4

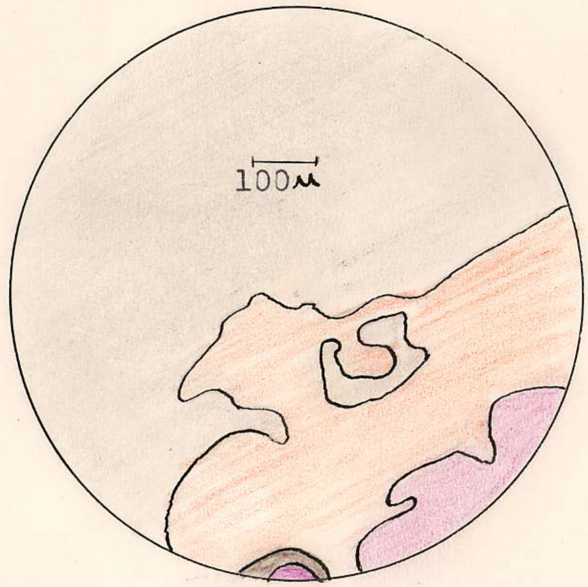
Orange-Chalcopyrite

Yellow-Pyrite

Grey---Quartz

Chalcopyrite replacing pyrite

Figure 4



Specimen 5

Purple-Scheelite

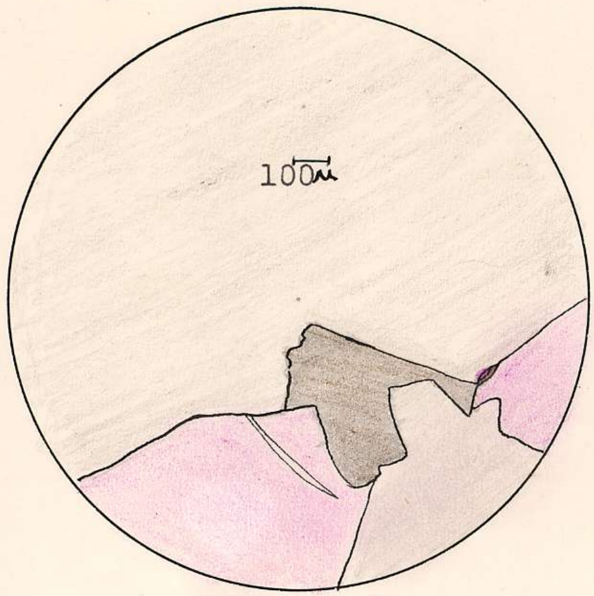
Orange-Chalcopyrite

Brown--Calcite

Grey---Quartz

Association of quartz,scheelite,calcite,and chalcopyrite

Figure 5



Specimen 5

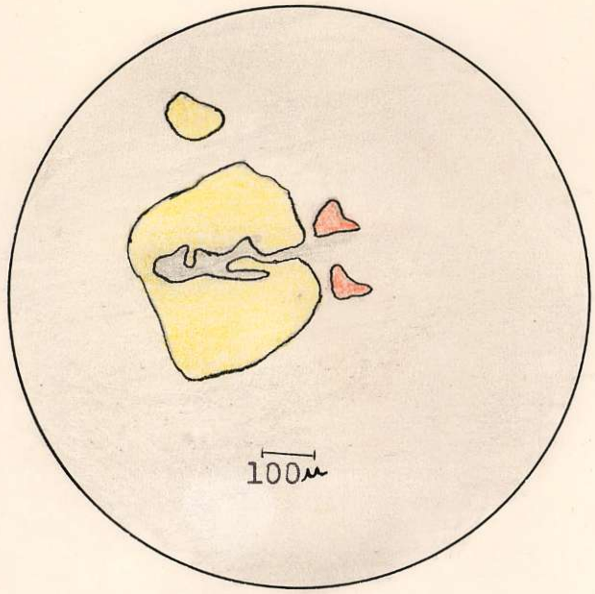
Purple-Scheelite

Brown--Calcite

Grey---Quartz

Quartz.and calcite veining scheelite

Figure 6



Specimen 7

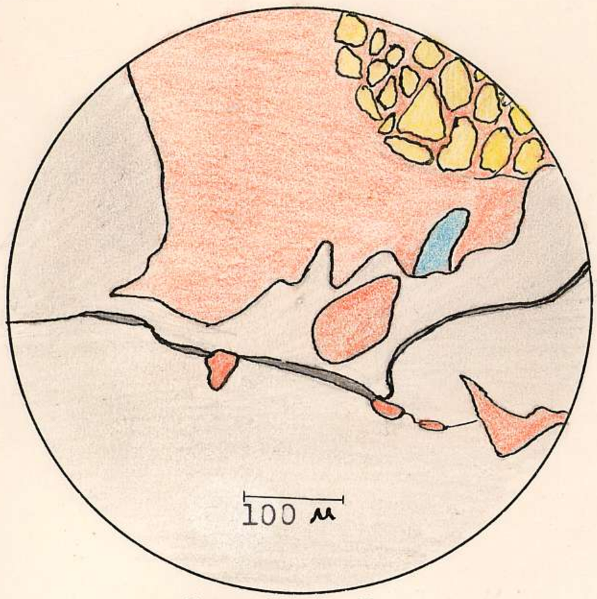
Yellow-Pyrite

Orange-Chalcopyrite

Grey---Quartz

Quartz replacing pyrite

Figure 7



Specimen 3

Yellow-Pyrite

Orange-Chalcopyrite

Blue---Hessite

Brown--Calcite

Chalcopyrite replacing pyrite
Hessite associated with chalcopyrite

Figure 8

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