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A MINERALOGRAPHIC REPORT ON
THE HORN SILVER MINE

Geology 409 - Fourth Problem

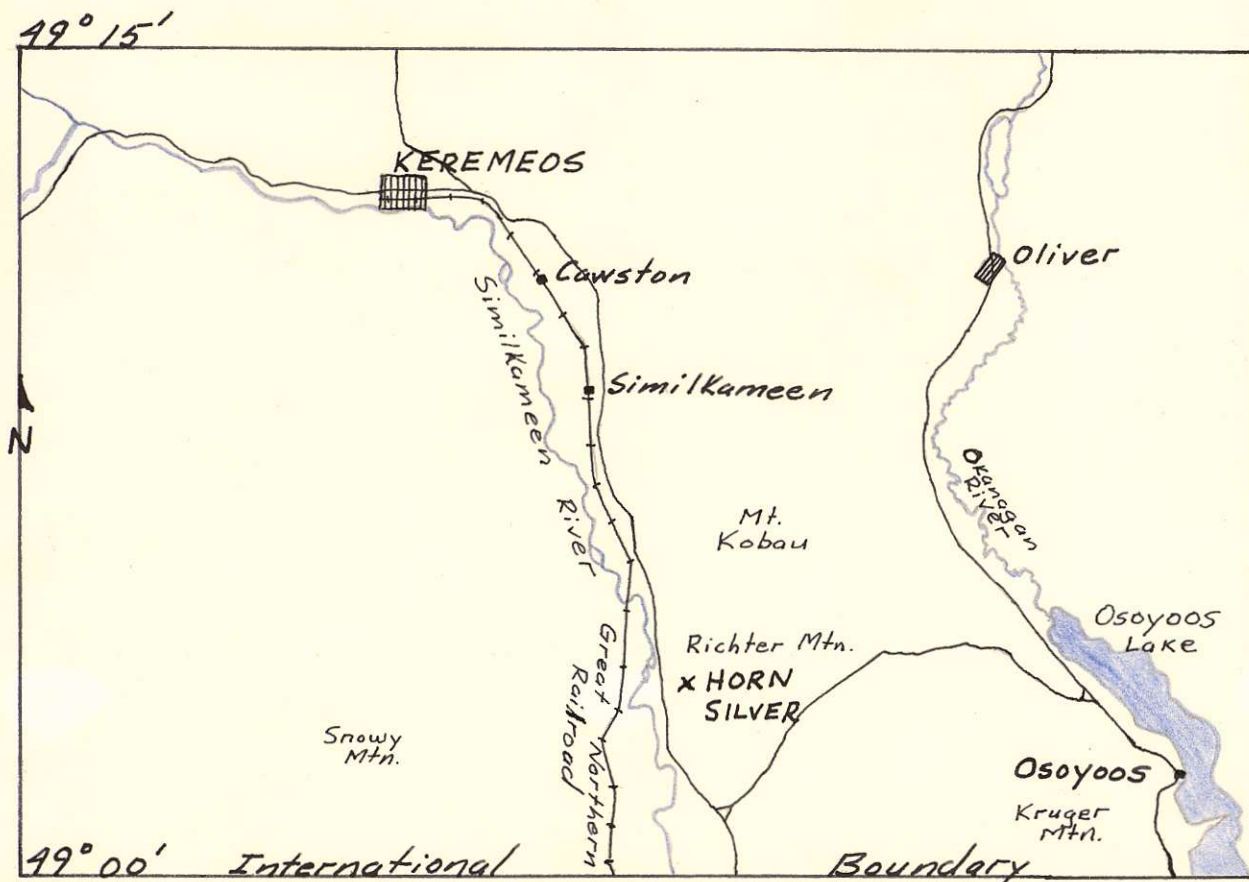
JIM McINNES

April 1960

Location

Horn Silver Mine ($49^{\circ}11'19''$ S.W.) - Keremeos Map-area and Kettle River (West Half) Map-area.

The property, a small, silver-gold deposit of the fissure vein type, is on the east slope of Richter Mountain, 16 miles south of Keremeos, B.C. and 4 miles north of the International Boundary. Access is by a paved road from Keremeos to a point near the foot of Richter Mountain, from where a short side road leads to the ore-loading platform at 1,300 feet elevation. The adit portals at 2,622 feet elevation are reached by a steep jeep-trail one mile long.



Location Map - scale: 1" = 4 mi.

History and Previous Work

The mine is presently owned by the Canadian Radium Corporation Limited. The company office is at 1024, 85 Richmond Street West, Toronto 1, Ontario. The president of the company is W.L. Hodgson of Scarborough, Ontario. H. Parliament is the resident engineer at Keremeos, British Columbia, where the mine office is located. The company was capitalized at 7,500,000 shares of no par value and controls the old Horn Silver property, comprising the Horn Silver and Silver Bell Crown-granted claims and seven recorded claims.

The property was staked in 1901 by Joseph Hunter. Development and production took place from 1915 to 1933 when a total of 5,824 tons of ore were mined, yielding 667 ounces of gold and 245,406 ounces of silver. A 22-ton per day cyanidation mill was erected and operated in 1926, but was suspended shortly afterward owing to the exhaustion of suitable ore for the process. The mine has been developed from two adits -- an east adit at 2,622 feet elevation and a west adit at 2,615 feet elevation. When the present company resumed development in 1958, there were approximately 2,200 feet of open underground workings. The company began work at the end of April 1958, and continued to the end of the year. The following is a summary of the work done:

Surface stripping	1,868	feet
Drifting	415	"
Raising	130	"
Diamond Drilling (Underground)	1,721	"

During this period a total of 54 tons of ore was shipped to the Trail and Tadanac smelters, yielding 15 ounces of gold and 3,684 ounces of silver. An average crew of 8 men was employed.

General Geology

The mine workings are in a large body of Mesozoic alkali syenite which has intruded a series of Paleozoic quartzites and greenstones. The contact with the sediments is about a quarter of a mile north of the mine, and extends in a general east-west direction.

In the immediate vicinity of the mine the alkali syenite is the chief country rock. In it are several bodies of hornblendite and various dykes of rock types allied to the alkali syenite. The alkali syenite has been mapped by R.A. Daly as part of the Similkameen soda granodiorite batholith. The igneous rocks of the Horn Silver mine are evidently part of this body and also related to the alkaline body of Kruger Mountain a few miles southeast.

The limits of the alkali syenite body extend from the mine a quarter of a mile north, the same distance south, a mile east, and to the floor of the Similkameen valley on the west.

The veins strike approximately east and dip as much as 30° south. They range in width from a few inches up to 6 feet, and are highly faulted. The vein material consists in some places of hard banded quartz, and in others of soft, crumbly

quartz and gouge. Minerals present are pyrite, chalcopyrite, sphalerite, galena, and native silver. Argentite, tetrahedrite, and cerargyrite are reported to occur, but no trace of any of these could be found in the specimens examined. Bostock (1927) also could not find any definite trace of these three minerals.

Megascopic Examination

The hand specimens examined are vein material consisting of a quartz gangue which is coated with chlorite on the edges and with sericite in lesser amounts throughout the entire rock. Very fine stringers of calcite less than 1 mm. across fill fractures in the main quartz gangue. In some specimens the quartz appears to have a comb structure on the edges of the vein where the crystallization is perpendicular to the wall of the vein. This structure persists for an average of 1 inch in from both sides. The central portion is approximately 3 inches of massive quartz. Large numbers of small fractures and the ease of shattering of the quartz indicate that ^{the} veins have been highly fractured. In some places the quartz is quite drusy with minute quartz crystals in the small pits.

Mineralization in the quartz appears to follow fractures varying from a fine line to 1/2 of an inch across in most instances, but also occurs in thin layers on both sides of some quartz bands and as isolated, irregular patches of disseminated crystals. In most cases the mineralized fractures run parallel to the walls of the vein and give the ore a banded appearance.

Identifiable minerals are pyrite, chalcopyrite, galena, sphalerite, and native silver. The pyrite is fine and coarse-grained and occurs in patches with other sulphides and in isolated parts of the gangue. The chalcopyrite occurs in and on the borders of sphalerite mainly and rarely as isolated patches in the gangue. It is fine-grained for the most part but many small crystals which alter to a pinkish purple and blue color are seen. Fine to coarse-grained sphalerite and galena occur together, mostly in fractures and on mineralized edges of the vein. The sphalerite predominates. Native silver can only be seen isolated from the other minerals. It occurs as small, thin, irregular films on what appear to be fracture surfaces in the gangue. These films are only a few millimetres in (size) ^{thickness?} and are tarnished to a light pink color.

Microscopic Examination:

Sphalerite:

✓ ZnS; Isometric; color gray; hardness C. HNO₃ fumes tarnish; HCl, KCN, FeCl₃, KOH, and HgCl₂ negative; aqua regia effervesces and stains dark brown.

Galena:

✓ PbS; Isometric; color galena white; hardness B. HNO₃ turns black. HCl tarnishes iridescent. KCN negative. FeCl₃ stains iridescent. KOH and HgCl₂ negative. Abundant triangular pits.

Chalcopyrite:

✓ CuFeS₂; Tetragonal; color brass yellow; hardness C. HNO₃ fumes tarnish. HCl, KCN, FeCl₃, KOH, and HgCl₂ negative. Gives powder when scratched. Occurs mainly as small inclusions in sphalerite.

Pyrite:

✓ FeS₂; Isometric; color pale brass yellow; hardness F.
Square cross section.

Native Silver:

✓ Ag; Isometric; color silvery white; hardness B.
HNO₃ effervesces and leaves white coating. HCl
fumes tarnish. KCN tarnishes brown. FeCl₃ stains
iridescent. KOH negative. HgCl₂ stains iridescent.
Very sectile.

Gangue:

✓ Quartz with calcite in fractures.

Minerals in decreasing order of abundance:

✓ Quartz - approximately 95 per cent
Sphalerite
Galena
Pyrite
Chalcopyrite
Calcite
Native Silver

Textures:

The textures mentioned here are illustrated in the appendix of this report.

(1) Emulsion texture. Small blebs of chalcopyrite are scattered uniformly throughout the sphalerite. This texture probably formed by exsolution.

(2) Rim texture. In one instance chalcopyrite forms a partial rim around native silver. This texture has no significance towards determining the paragenesis of the deposit. The chalcopyrite probably exsolved from the sphalerite and its proximity to the native silver is most likely a coincidence.

Other textures seen in the ore specimens show galena replacing sphalerite and native silver replacing galena. In many cases galena is interstitial to sphalerite. The calcite in the fractures cuts through pyrite and sphalerite and is probably the last constituent of the deposit to form.

Paragenesis:

- (1) Quartz
- (2) Pyrite
- (3) Sphalerite-Chalcopyrite
- (4) Galena
- (5) Native silver
- (6) Calcite

Conclusion:

The comb structure in the quartz is indicative of open space filling. The fracturing in the quartz is pre-ore since all mineralization is related to the fractures. The first minerals in the deposit probably formed at slightly above 400°C. On cooling to 400°C, the chalcopyrite began to exsolve from the sphalerite.

check An etch was not obtained on the native silver by using chromic acid or ammonium persulphide, but it is considered to be supergene because of its relation to the fractures in the quartz. The native silver probably formed after the temperature had cooled below 200°C.

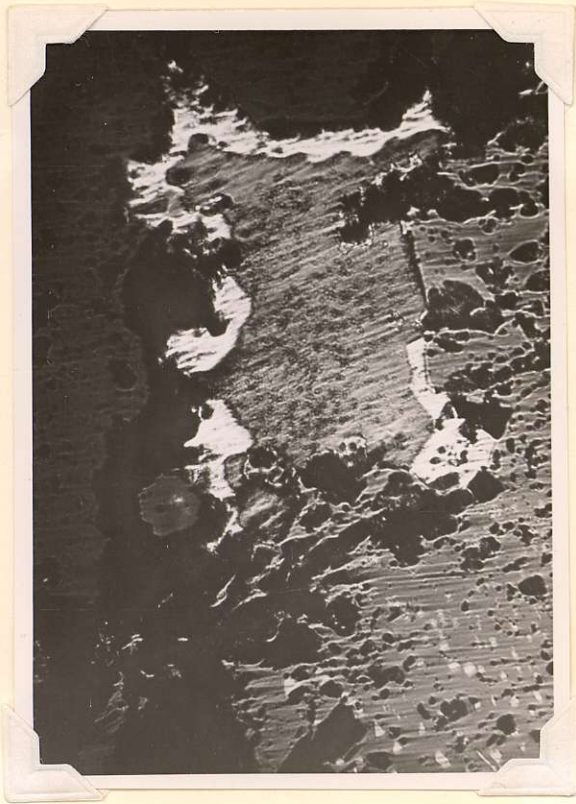
Bostock classifies this deposit as a fissure vein type.

*If supergene, it would probably be at room temp.
Some doubt if all the native Ag is supergene. occasional "chunks" in open space in quartz. not all present as films. need a better sinte.*

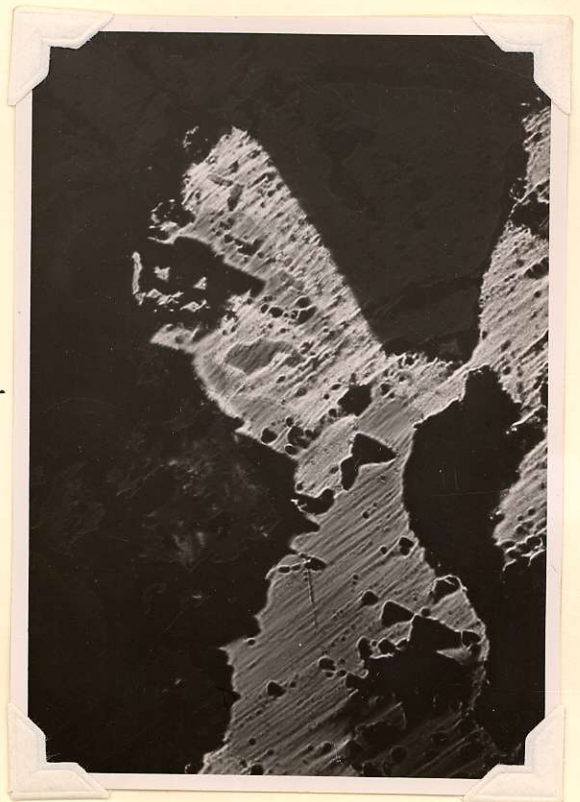
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Native silver rimming galena.
X150



Galena and native silver intergrown.
X150



Chalcopyrite rim on Native Silver.
x150



Emulsion of Chalcopyrite in
sphalerite.
x150



Native silver filling fracture in quartz.
X150



Galena replacing sphalerite.
X150