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MINERALOGY OF THE ROBSON GROUP.

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MINERALOGY OF THE ROBSON GROUP

Introduction:

The geology and mineralogy of the Robson Group have been determined rather completely by previous investigators. The main purpose of this report is to substantiate this previous work and to present an economic outline of the property so that an overall picture of the deposit can be obtained in one report.

The Robson property is located in the Bonanza Basin in the Tyaughton Lake area, north of the Bridge River mining area. This remote location is the main item which militates against the development of the property.

The regional geology is relatively complex and it is not within the scope of this report to describe it in detail. Briefly, the main exposures are massive quartzite of the Eldorado series cut by diorite stocks. These stocks are not known to be overlain or cut by younger rocks. The main showing is a strong fissure vein, and indicates several periods of mineralization. It should be mentioned that diorite stocks were noted early in the history of this area as being indicative of antimony association.

The reader is referred to the references given at the end of the report for a more detailed description of the regional geology.

Mineralogy

The following minerals, listed in the probable order of deposition, were determined in the sections examined.

Calcite
Quartz
Arsenopyrite (Gold)
Sphalerite
Zinkenite
Pyrite
Chalcopyrite
Tetrahedrite (Silver)

The methods used for determining the minerals are those given in Short. ¹

There is some doubt as to whether the arsenopyrite should be listed at the beginning or just after the zinkenite. There is evidence that the arsenopyrite is deposited at about the same time as quartz and calcite, but a large proportion is apparently deposited after zinkenite and at about the same time as pyrite. Similarly, there is an indication that a portion of the pyrite is deposited at an earlier period than that shown above. Quartz, the chief gangue mineral, is difficult to place accurately from the sections examined, but it apparently comes after each period of fracturing.

The following table will give a better visual picture of the mineralogical sequence.

	Alteration of wall rock	Fracturing of wall rock	Filling of fractures	Fracturing of arsenopyrite	Filling of fractures	Second deposition of pyrite and arsenopyrite	Approximate end of high-temp. deposition	Fracturing	Filling	Fracturing	Filling
Calcite											
Quartz	—			—					—		—
Arsenopyrite	—	—				—	—				
Sphalerite			—						—		
Zinckenite				—	—				—	—	—
Pyrite						—	—				
Chalcopyrite		—	—								—
Tetrahedrite											—
Gold	—	—									—
Silver									—	—	—

Jones and Sharp ² have but one mineralizing period for arsenopyrite and have placed the fracturing of arsenopyrite after this period. However, the writer is of the opinion that there are at least two mineralizing periods for arsenopyrite and that the fracturing occurs before the second period.

The comb structure of the quartz is suggestive of medium temperatures, and the arsenopyrite-quartz comb structure marks the end of high temperature deposition.

Jones and Sharp state that the wall-rock is "silicified argillite. . . (with) alteration by mineralizing solutions."

Lynott ³ gives the following assay of a representative

sixty-pound sample:

Gold	1.68 oz./ton
Silver	22.95 oz./ton
Arsenic	11.5 %
Antimony	11.8%
Lead	9.7%
Copper	0.47%
Zinc	3.9%
Sulphur	14.2%

Any other minerals present, other than those stated previously, are in such small amounts that they can be assumed to be less than one-percent of the deposit. The above assay can then be shown to include:

Iron: 9.5%

Gangue (chiefly quartz and calcite): 38%

The distribution of the sample can be found metallurgically as follows:

Quartz, calcite, etc.	38 %
Zinkenite	27.0%
Arsenopyrite	25.0%
Sphalerite	5.8%
Pyrite	1.8%
Tetrahedrite	1.7%
Chalcopyrite:	< 0.1%

Whether or not this distribution of minerals applies to the property as a whole depends entirely on how representative the sample is.

Arsenopyrite: The arsenopyrite occurs usually in good crystal form, and is often found embedded in sphalerite. More commonly it occurs in zinkenite. Where the arsenopyrite is fractured, the fracture is usually filled by quartz or zinkenite.

Sphalerite: The sphalerite is usually found with zinkenite at the grain boundaries or with the zinkenite included as random particles within the sphalerite grain. Sphalerite is often found around quartz crystals, and wherever quartz and calcite are fractured sphalerite is the common filling material. Where tetrahedrite was seen, sphalerite was the surrounding ground mass, but this may not always be true.

Zinkenite: This was determined microchemically as a lead antimonide, and other investigators have gone through exhaustive tests to show it is zinkenite. It occurs around euhedral quartz crystals, around sphalerite grain boundaries, included randomly within calcite and sphalerite, and as small rhombs embedded in arsenopyrite. Wherever tetrahedrite is found zinkenite is found as small stringers running through the tetrahedrite. When zinkenite is found filling fractures, or replacing sphalerite, it commonly occurs with small crystals of arsenopyrite embedded within.

Pyrite: This is found only in small amounts, and is found as rounded crystals in quartz. In the few instances it

was seen, it was side by side with arsenopyrite crystals. It may or may not be significant, but the ground mass of quartz where pyrite is found is commonly fractured, and filled by calcite.

Chalcopyrite: This is found in small amounts in arsenopyrite, side by side with rhombs of zincenite. More commonly, it occurs as small stringers in sphalerite.

Tetrahedrite: Tetrahedrite is not too common in the sections examined. When it is found, it comes in deposits about one-eighth inch in size. Visually it is almost the same colour as zinkenite, which occurs as small stringers in the tetrahedrite. Where the tetrahedrite and the zinkenite are found together they appear to have been deposited at about the same time, or the zinkenite may have been deposited just a little earlier.

Quartz: Quartz is the most abundant of all the minerals present. It often exhibits a comb structure, with zinkenite forming the network between quartz crystals. Quartz commonly heals fractures in sphalerite and arsenopyrite.

Calcite: Calcite is found with early arsenopyrite and quartz. The arsenopyrite is at the interface of the calcite and quartz, which appear to have been deposited at the same time. Calcite commonly fills fractures in quartz.

Gold: Although gold is present, none was found in the sections examined at magnifications up to 500X. It is obviously of a disseminated nature, and occurs almost entirely in arsenopyrite.

Economics

Jones and Sharp in their excellent report describe the distribution of the gold and silver. They conclude that arsenopyrite is the chief gold-bearing mineral. Hand-picked samples of apparently pure arsenopyrite assayed 5.5 and 5.99 oz. Au/ton, which is to say the arsenopyrite carries 82 to 89 percent of the gold. The sphalerite plus the pyrite contain about one-tenth of one-percent of the gold, and assays indicate that the amount of gold carried in the other metallic minerals is negligible. Tests were run to determine if the quartz carried any of the gold. On different samples of quartz (apparently pure) the results were:

- 1) 0.013 oz. Au/ton
- 2) 0.068 oz. Au/ton
- 3) trace

These results are erratic and are included here just so they will be on record. It would appear that the quartz does not carry more than one percent of the gold. The value of the gold in the arsenopyrite as given above is probably low due to inclusions of some other mineral, so that it would seem reasonable to assume that all the gold is in the arsenopyrite.

The distribution of the silver, however, is a point open to argument. Jones and Sharp give the following assays for hand-picked samples:

Arsenopyrite	1.8 oz. Ag/ton
Tetrahedrite	503 oz. Ag/ton
Zinkenite	50.7 oz. Ag/ton

Calculations will show that, therefore, 2 percent of the silver is carried in arsenopyrite and 37 percent in tetrahedrite. Their statement that the tetrahedrite is the main silver carrier is obviously misleading. The assays of Lynott would have to be entirely wrong in order to justify this statement, as there would have to be more than 1.7 percent tetrahedrite in the ore. This is extremely doubtful as there would have to be almost 6 percent tetrahedrite in the ore (or as much tetrahedrite as there is sphalerite) and a visual examination will show that this is not true. The statement by Jones and Sharp that the silver in the zinkenite is due to inclusions of tetrahedrite is wrong. If this were true the zinkenite would have to contain 10 percent tetrahedrite, and by examination the zinkenite does not contain tetrahedrite (certainly not in amounts up to 10 percent). In fact, the converse is true, i.e., the tetrahedrite usually contains zinkenite. Moreover, Jones and Sharp showed that the zinkenite that was tested ran only 1.8% copper. If there were 10 percent tetrahedrite in the sample there would have to be at least 4-5 percent copper. (To say nothing of the fact that chalcopyrite occurs with zinkenite.) It is also

doubtful that some other silver-bearing mineral is present in the zinkenite. There are, as a rule, no inclusions seen in zinkenite at 500X (other than calcite, which would lower the silver content); and if inclusions are present then, since their amount is small, their silver value must be fabulously high.

It must be assumed that the zinkenite carries silver to account for the remaining 61 percent of the silver. If the assay of the zinkenite is assumed to be correct at 50.7 oz. Ag/ton then the zinkenite carries 59.5 percent of the silver. It is, therefore, the opinion of the writer that, although the tetrahedrite is richer in silver content, the zinkenite is the chief silver carrier.

It was found that the tetrahedrite contains nickel, but in what amounts is not known. The fact that nickel was present in tetrahedrite was discovered towards the end of the investigation, so that there was little work put on this phase. Certainly there is not enough nickel to affect the economic situation.

Using the present Trail smelter schedule for lead ores, and charging for antimony, the deposit is worth about seventy-five dollars per ton, shipping without concentration. At the most, freight and mining would be fifty dollars, leaving a positive balance of twenty-five dollars per ton. The major part of the value lies in the gold content so that the recovery of the arsenopyrite becomes important. The arsenopyrite can be recovered easily by flotation, the particle size

required for flotation being small enough so that the arsenopyrite grains are bound to be freed. The arsenopyrite concentrate could then be shipped to Trail, if they were willing to accept the arsenic. Gravity concentration, however, would seem to be the best method of concentration. The tetrahedrite, zinkenite, and arsenopyrite, in which lie almost all the gold and silver, each have a specific gravity over 4.5, so that tabling or jigging at a particle size of about - 10+28 mesh would recover most of the value with low milling costs. The tailings would be re-ground and tabled. This re-grinding would have to be done to 325 mesh to ensure freeing the remainder of the zinkenite which is disseminated through the gangue.

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As Shown x200

Zin - Zinkenite
Ch - Chalcopyrite
Ars - Arsenopyrite

FIG. 1

Crystals of zinkenite in arsenopyrite matrix. The arsenopyrite is probably deposited after the zinkenite. Chalcopyrite apparently deposited at about the same time as zinkenite.

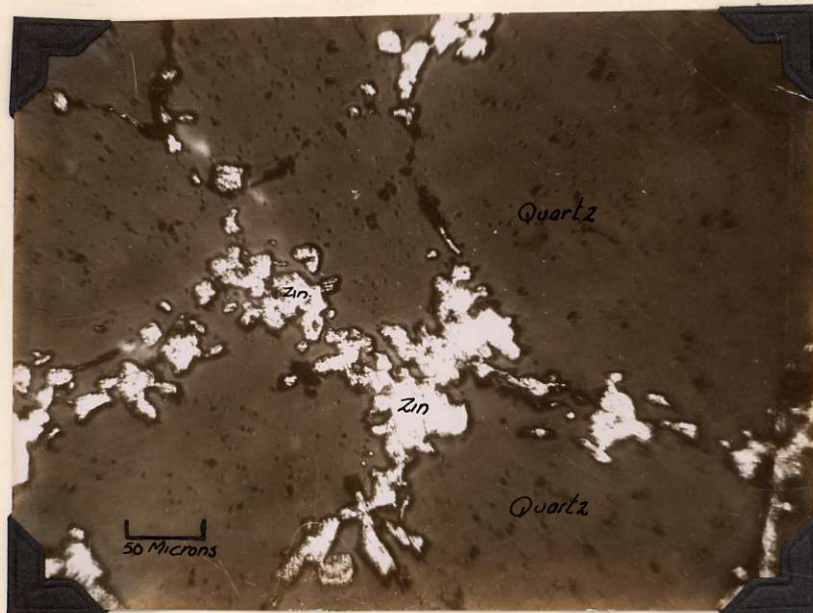


As shown x200

Ch - Chalcopyrite
Cal - Calcite
Zin - Zinkenite

FIG. 2

Stringers of chalcopyrite through sphalerite. Calcite replaces sphalerite, and chalcopyrite may have come in with the calcite.

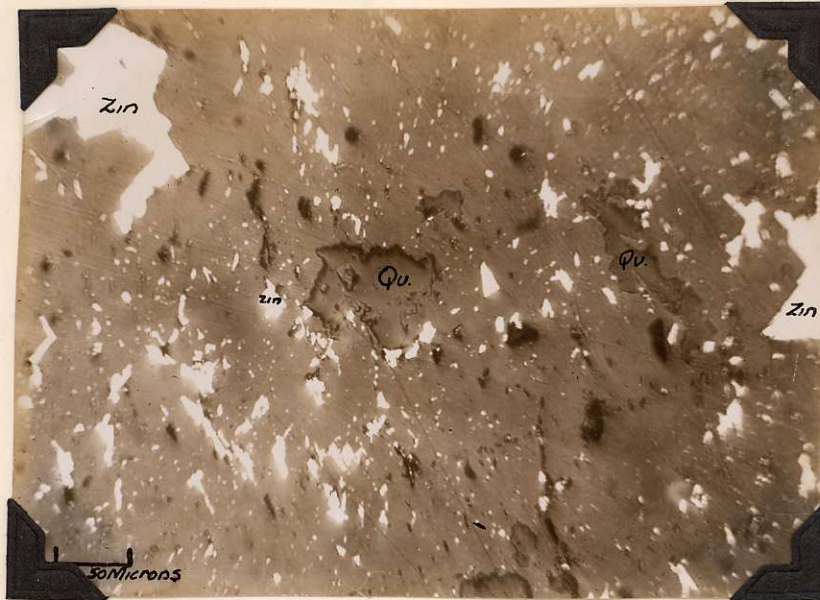


As Shown x200

Zin - Zinkenite

FIG. 3

Euhedral crystals of quartz surrounded by zinkenite.
The zinkenite may be replacing the quartz.



As shown x 200

Qu - Quartz
Cal - Calcite
Zin - Zinkenite

FIG. 4

Disseminated zinkenite in calcite. Calcite probably replacing quartz.