A REPORT ON ORES FROM THE LE ROI, CENTER STAR, AND WAR EAGLE MINES OF ROSSLAND B.C.

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APRIL 1947

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INTRODUCTION

ACKNOWLEDGMENT:

The writer wishes to thank L.O. Gouin, R.A. Seraphim, J.G. Fyles and the many others for their generous assistance and advice.

PURPOSE:

The purpose of this study is to determine the minerology and paragenesis of typical Rossland ore.

SOURCE OF SPECIMENS:

The specimens studied were sulfide ores of the Center Star, Le Roi, and War Eagle, which are located in the Trail Creek Mining District, on the south slopes of Red Mountain, approximately one-quarter mile northwest of Rossland. These Claims were first staked in 1890.

ORE OCCURRENCE AND ORIGIN

" The Rossland ore consists mainly of pyrrhotite and chalcopyrite associated with a gangue of altered country rock, containing some quartz and locally a little calcite. The sulfides form from 50 to 70 per cent of the mass. The values are largely in gold (0.4 to 1.2 ounces), with some copper (0.7 to 3.6 percent) and a little silver (0.3 to 2.3 ounces). There are all transitions from typical ore to solid sulfides or to rock matter, or to gangue with little apparent mineralization but carrying values."*

It has been concluded by Drysdale that the ore deposits of the producing belt at least, are replacement veins along fissures and sheeted or shear zones. In other words, the

alkaline aqueous mineralizing solutions and gases were forced into these zones of shearing under conditions of high temperature and pressure, transforming the fractured and brecciated country rock into ore through practically simultaneous solution and precipitation. Drysdale concluded that the fissures and shear zones have been controlled in their development by the formational contacts and that the ore shoots are chiefly contact shoots.

* Ref: Geology and Ore Deposits of Rossland, B.C. C.G.S. Memoir 77, C.W. Drysdale.

MINERALOGY

Megascopic Examination:

In hand specimens only two sulfides are obvious, namely pyrrhotite and chalcopyrite. These two sulfides appear to be an intimate intergrowth from one melt for in some specimens the pyrrhotite is seen to vein the chalcopyrite while in others the reverse is true. Often the two minerals seem to bear a eutectic relationship to one another.

After close scrutiny a few grains of pyrite were seen.

The chalcopyrite and pyrrhotite appear to have a fine grained to massive texture.

Altered country rock consisted of brecciated quartz grains, somewhat stained by iron oxides, and scattered flakes and irregular masses of dark-green chloritic minerals.

Large grains of calcite, apparently of primary origin, and up to $\frac{1}{4}$ inch in diameter occur with the chalcopyrite and pyrrhotite in some specimens.

Microscopic Examination:

Pyrite: Pyrite occurs as euhedral grains which are few in number but are the largest single grains of all minerals present.

Pyrite occurs also as a few smaller irregular grains which have short narrow veinlets extending into the shattered quartz.

All the pyrite grains are shattered and a few are veined by chalcopyrite.

Pyrrhotite: Pyrrhotite of two ages are present. The oldest pyrrhotite occurs as a few rounded grains but for the most part is very fine grained or almost massive. It is badly fractured, but less so than the pyrite, and intruded by small veins of chalcopyrite.

The youngest pyrrhotite occurs as narrow veins and connected rounded patches in a slightly fractured chalcopyrite.

Chalcopyrite: Chalcopyrite occurs in a fine grained to massive form and veins the quartz, pyrite, and pyrrhotite.

Arsenopyrite: Arsenopyrite occurs as very small irregular grains and as few diamond-shaped crystals which can be seen clearly only under high power. The arsenopyrite occurs with pyrrhotite and chalcopyrite and seems of the same age as the chalcopyrite and the second generation of pyrrhotite.

Calcite: Calcite occurs as large crystals ($\frac{1}{2}$" x $\frac{1}{4}$") showing good cleavage and regular boundaries, in apparent eutectic association with chalcopyrite and pyrrhotite.

(In the specimen examined, the chalcopyrite appeared to be concentrated around the calcite).

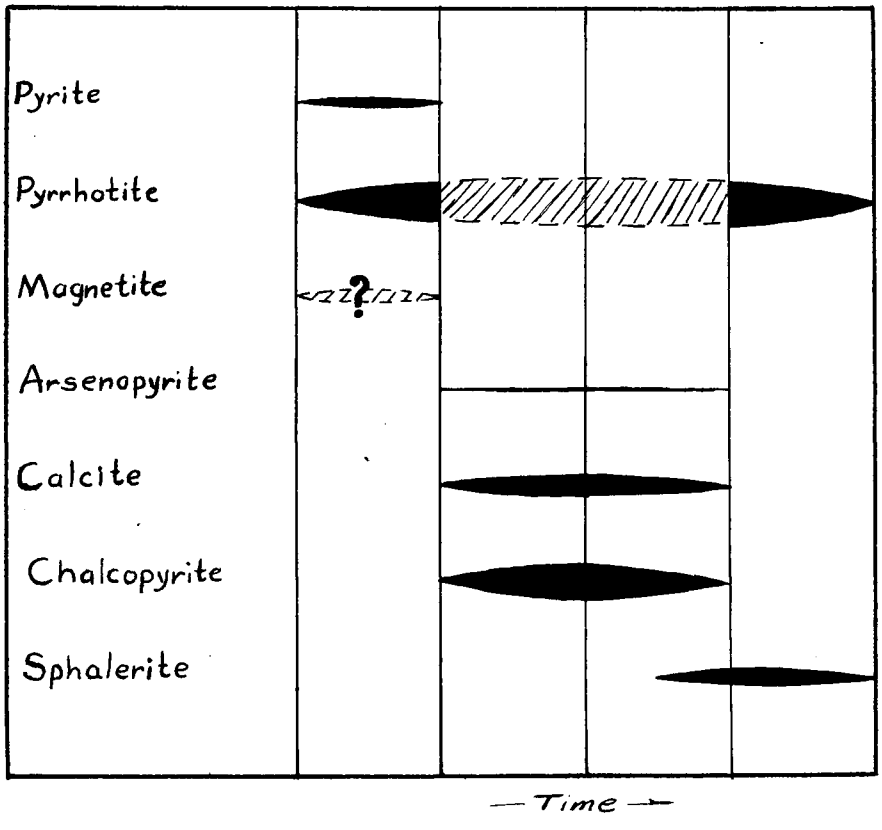
Sphalerite: Sphalerite occurs as lineations which outline the grain boundaries of chalcopyrite. Under higher power these sphalerite grains appear to have no definite shape although a few appear to be triangular as if ingressing the crystal pattern of the chalcopyrite. The writer was not certain whether the chalcopyrite was replaced by the sphalerite or whether these two minerals were derived from the same melt. Nevertheless the sphalerite was thought to have crystallized after the chalcopyrite.

Sphalerite also occurs as larger rounded grains in both chalcopyrite and pyrrhotite, being more abundant in the former. One or two larger grains of sphalerite were seen to contain inclusions of pyrrhotite of presumably the first generation.

Magnetite: A small amount of magnetite may be present in most or all of the sections as small rounded grains but the fact that there are present quartz grains of a variety of colours and optical orientations, might easily discredit the recognition of the magnetite by only its physical appearance. The magnetite shows no definite age relation to the other minerals present.

Note: No free gold or silver was seen in any of the sections.

Paragenesis Chart



APPENDIX

INTRODUCTION

Included with the specimens from Rossland was one piece of ore from "Bruce Mines", donated by C.F.Connor. This specimen became the most interesting of the collection, but unfortunately, because of the uncertainty of whether or not this specimen rightfully belonged to the Rossland collection, it is included in this report as an appendix and as a probable "Sudbury" ore.

MINERALOGY

Magascopic Examination:

A hand specimen of this ore appeared to be composed of four minerals, namely pyrrhotite, chalcopyrite, magnetite, and chlorite. Pyrrhotite seemed to comprise about 40 per cent, chalcopyrite about 35 per cent, and magnetite about 25 per cent of the specimen. Chlorite was present as a few dark green grains, usually near concentrations of magnetite. Chalcopyrite and pyrrhotite appear to be crystalline but the crystals subhedral; whereas magnetite occurs as tetrahedrons, dodecahedrons, and combinations of these and other forms. Magnetite occurs disseminated in the other sulfides and also as concentrations in ellipsoidal and spheroidal masses.

Microscopic Examination:

Microscopic examination revealed, in addition to chalcopyrite and magnetite, pyrrhotite of two generations, pentlandite, and sphalerite.

Pyrrhotite: Pyrrhotite of two ages and probably two

different compositions were observed. The older pyrrhotite occurs as slender spindle-shaped grains surrounded by larger, usually hexagonal grains of the younger pyrrhotite. The younger pyrrhotite is much more plentiful than the older, the ratio probably being 6 to 1. In a hand-polished section, without crossed nicols, the two minerals cannot be distinguished but in a less highly-polished section or with crossed-nicols the two can easily be seen. Pyrrhotite forms over 40 percent of the minerals present.

Pentlandite: Pentlandite occurs in pyrrhotite and chalcopyrite as irregular but smooth-edged grains which often show a distinct cubic cleavage. The pentlandite, some chalcopyrite and pyrrhotite appear to have formed simultaneously as a eutectic mixture, but some chalcopyrite is definitely younger than the pentlandite and can be seen replacing pentlandite. The pentlandite seems to be younger than the older pyrrhotite (pentlandite was observed to have ingressed a spindle of pyrrhotite) and contemporaneous with the younger pyrrhotite. The pentlandite and pyrrhotite are intergrown, usually only on one side of a pentlandite grain, where slender pointed fingers of pentlandite invade the pyrrhotite or vice versa. Pentlandite forms about 10 per cent of the minerals present.

Chalcopyrite: Chalcopyrite forms about 30 per cent of the minerals present and, as has already been mentioned, appears to be both contemporaneous with and younger than the pyrrhotite and pentlandite.

Sphalerite: Two small cubic-rounded grains of sphalerite were observed in chalcopyrite and were thought to be possibly of the same age. Sphalerite may be later but no age relation was seen to prove that it was so.

Magnetite: Magnetite occurs as euhedral crystals and forms about 20 per cent of the minerals present. Several crystals of magnetite contained inclusions of chalcopyrite and pyrrhotite and may have crystallized later than both of these minerals. On the other hand, these inclusions may have been trapped as droplets and later crystallized inside the magnetite grains.

ASSAY

A specimen of this ore was assayed by the metallurgical department of the University and was found to contain 2.42 per cent nickel.

Paragenesis Chart

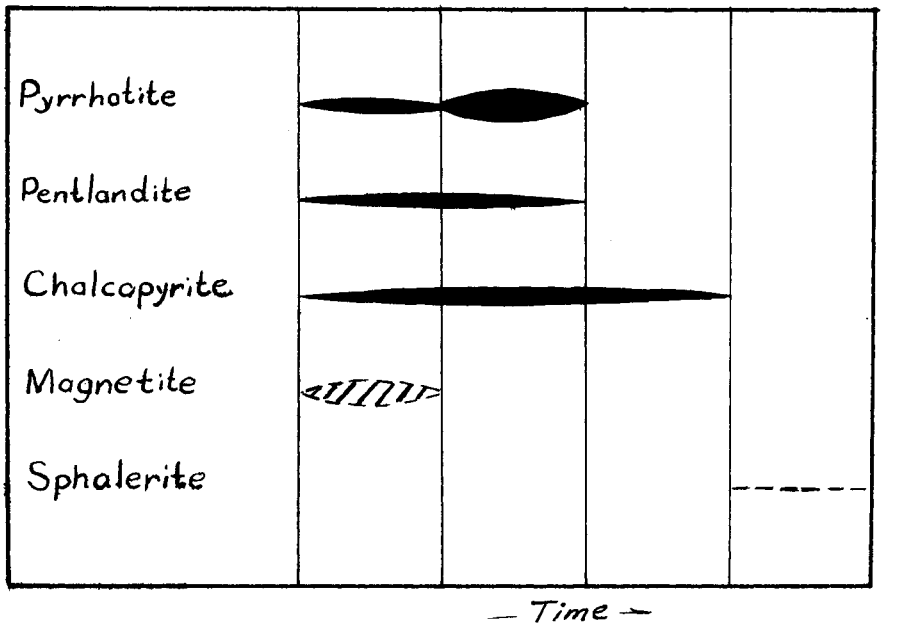


PLATE 1

Magnification - 150 X

C ---Chalcopyrite
M ---Magnetite
P ---Pentlandite
Pyrr-Pyrrhotite

MICROPHOTOGRAPH SHOWING CHALCOPYRITE REPLACING PENTLANDITE

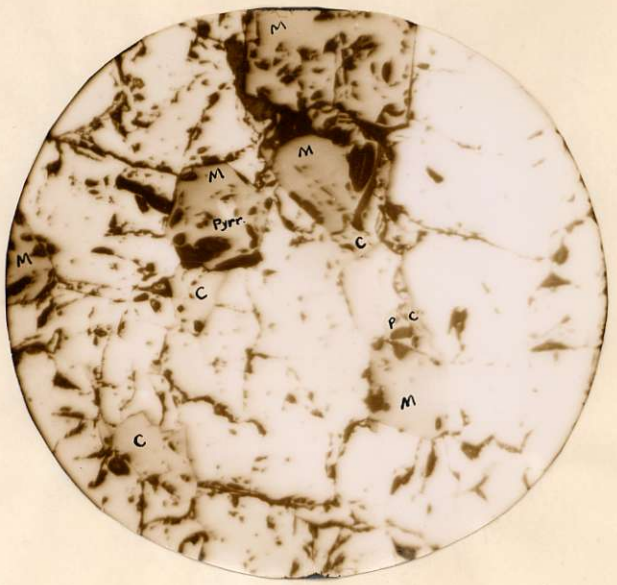
PLATE 2

Magnification - 50 X

C --- Chalcopyrite
M --- Magnetite
P --- Pentlandite
Pyrr Pyrrhotite

MICROPHOTOGRAPH SHOWING A PYRRHOTITE LATH OF THE FIRST GENERATION IN A PYRRHOTITE OF THE SECOND GENERATION.

PLATE 3



Magnification - 50 X

C --- Chalcopyrite
M --- Magnetite
P --- Pentlandite
Pyrr Pyrrhotite.

MICROPHOTOGRAPH SHOWING A PYRRHOTITE INCLUSION IN A MAGNETITE CRYSTAL

LIST OF SECTIONS

Rossland Ores.

(in Demar)

Spec.No.	Minerals Present	Locality
3	Arsenopyrite, Chalcopyrite, Pyrite, and Pyrrhotite in brecciated Quartz.	War Eagle
5	Chalcopyrite, Pyrrhotite, Sphalerite, rock Silicates, and Quartz	War Eagle
10	Chalcopyrite, Pyrrhotite, Sphalerite, and Calcite	Le Roi
10	Chalcopyrite, Pyrrhotite, Sphalerite, and rock Silicates.	Le Roi
14	Chalcopyrite, Pyrrhotite, Sphalerite, and rock Silicates	Centre Star
15	Arsenopyrite, Chalcopyrite, Pyrrhotite, Sphalerite, Quartz, and rock Silicates.	Centre Star

Note: Small amounts of magnetite may be present in the above sections.

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SUDBURY ORE (?)

(in red bakelite)

A	Chalcopyrite, Magnetite, Pentlandite, Pyrrhotite, Sphalerite.	Bruce Mines.

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