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GEOLOGY 409

A MINERALOGRAPHIC STUDY OF ORE FROM

GIANT MASCOT

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Introduction

The ore studied is from the Giant Mascot property (formerly B.C. Nickel), which is situated between Emory and Stulkawita creeks, seven miles from Choate which is six miles north of Hope, B.C., on the Frazer river. The property was first staked in 1923 and has had intermittent production since. Currently, a good nickel-copper ore is being mined at the rate of eight hundred tons per day.

The suite of specimens consists of three large hand specimens and about twenty-five polished sections, many of which are cut from small AX core. Tough pebbles, with thin sections, from the ball mill circuit are also included.

Megascopic

Two of the hand specimens were massive with irregular surfaces. They were composed of about fifty percent of black pyroxene and fifty percent sulphide minerals. The pyroxene, probably hypersthene, is sub-hedral to anhedral with individual crystals up to five millimeters. The sulphides are course grained aggregates of pyrrhotite, pentlandite and chalcopyrite which seem to be intercrystallized with the pyroxenes.

The third hand specimen consisted of massive sulphides only. The estimated mode was pyrrhotite 75%, pentlandite 17% and chalcopyrite 8%. The pentlandite occurs in long stringer like blebs in the pyrrhotite, individual blebs measure about 1/2 x 20 mm. Chalcopyrite is present as large anhedral grains scattered at random. This particular specimen is believed to represent a different orebody than the majority of the specimens

Microscopic

Thin Sections

The thin sections of the hard pebbles from the ball mill circuit were examined and the mode was estimated to be: Hypersthene 85%, Plagioclase (An_{50}) 10%, Opaque sulphide 5%. The rock is fine grained holocrystalline, and is composed of a random aggregate of equigranular hypersthene with subhedral interstitial plagioclase and metallic mineral (magnetite). The rock is a norite.

The toughness can be attributed to both the hardness of the component minerals and the interlocking aggregate of semi-fibrous hypersthene. However, this rock with metallic minerals in ore proportions would break and grind much easier.

Polished Section

1.) Mineral had a pock marked polish, a colour brown with a hardness of D. Anisotropic in browns and blues. The mineral is magnetic. Etch tests: KOH stains brown, HCl - slight effect in drop, HNO_3 gave a light brown tarnish. Identified as Pyrrhotite (FeS_{1+})

2.) The mineral takes a good polish and is coloured white - yellow with a hardness of D. Non-pleochroic and isotropic. Cleavage seen in some pieces. Always associated with pyrrhotite. Etch tests all negative. Indentified as Pentlandite $(FeNi)_9S_8$

3.) Mineral takes a good polish, has a yellow colour and a hardness of C. Weakly anisotropic in brown. The mineral is associated invariably with pyrrhotite. Etch tests all negative. Identified as Chalcopyrite ($CuFeS_2$)

4.) Mineral takes a fair polish and is coloured white to grey with a hardness of F. The grains are mostly euhedral and mineral is magnetic. Etch tests: HCl tarnished surface, others negative. Identified as Magnetite (Fe_3O_4)

5.) The mineral is yellowish with a poor polish with a hardness of E. Anisotropic in yellow, brown and green. Mineral seems to replace pyrrhotite or pentlandite and occurs both in rounded blebs and with a "herringbone" texture. It is negative to all etch tests. Identified as Marcasite (FeS_2)

6.) The mineral occurred in to small blebs in one section. It was gray with a hardness of B+. Isotropic. Etched tests: HNO_3 tarnished, HCl slight tarnish, aqua regia effervesced, others negative. Identified as Sphalerite (ZnS)

7.) The mineral showed a fairly good polish although slightly pitted. It was coloured very pale yellow and had a hardness of F. Isotropic. Etch tests: HNO_3 effervescent and tarnished. Identified as Pyrite (FeS_2)

Textures

Border relationships between pyrrhotite and the hypersthene seem to indicate that they crystallized almost simultaneously. Both minerals were observed to have plane or corroded surfaces against each other. The magnetite is always euhedral and in places is replaced by the hypersthene (see fig 1)

Pentlandite is seen ~~as~~ either as subhedral grains (see fig 3) in the pyrrhotite or as exsolution blebs (see fig 2). This indicates that the ~~pyrrhotite~~ pentlandite has a very close relationship to the pyrrhotite and crystallized either just before or ~~during~~ simultaneously with the pyrrhotite.

Chalcopyrite appears to replace the pentlandite and pyrrhotite, thus it was assumed to have crystallized slightly later than these other two minerals.

Marcasite is definitely an alteration product and is supergene. It ~~repl~~ alters the pyrrhotite & pentlandite and in places shows herringbone texture; in some sections it appears in a rounded bleb-like form. (fig 4 & 5)

Pyrite was seen in only one section, it occurred in small euhedral grains that were somewhat replaced by pyrrhotite.

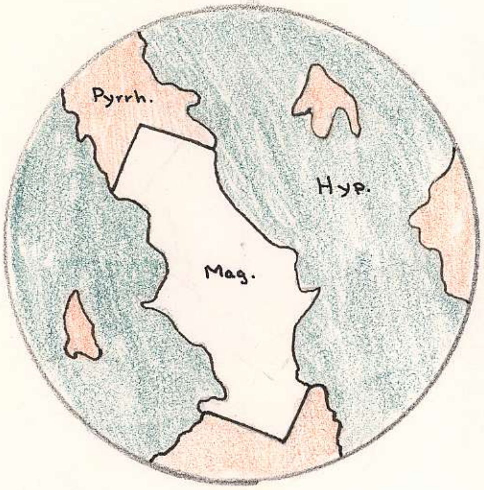
The mineral identified as sphalerite was also only seen in one section and occurred in very small grains that were near chalcopyrite but nevertheless isolated in hypersthene.

Paragenesis

The ~~induced~~ paragenetic sequence was induced as follows, the first crystallizing mineral first:

Primary	Magnetite Pyrite (Pyrrhotite, Pentlandite) Chalcopyrite Sphalerite	↑ increasing age
Supergene	Marcasite	

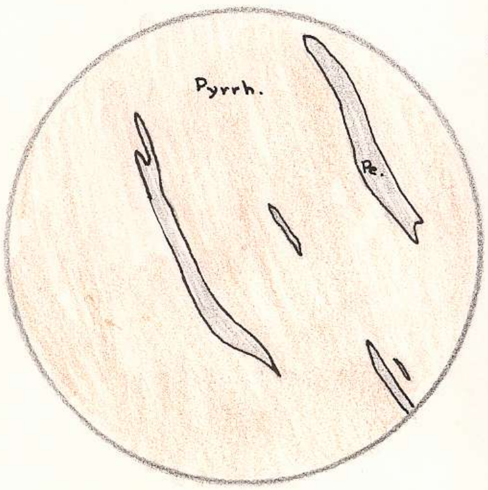
fig 1.



x 80

Hypersthene replacing magnetite. Pyrrhotite crystallized before hypersthene, note "protection" of magnetite by pyrrhotite.

fig 2



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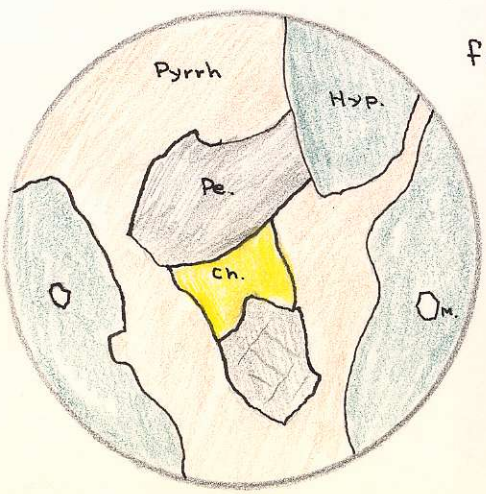
Large exsolution blebs of pentlandite in pyrrhotite

fig 3



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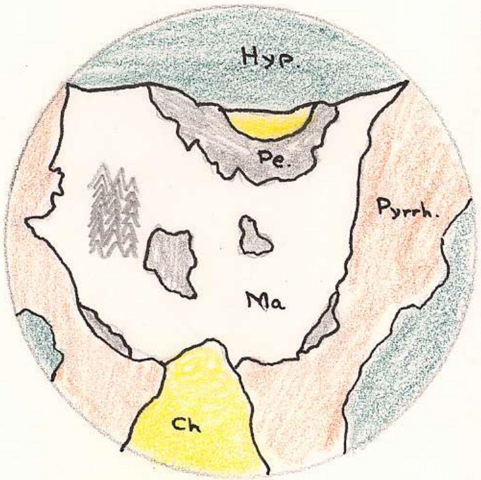
Subhedral and anhedral pentlandite in pyrrhotite. Note relation of chalcopyrite. Here hypersthene seems to have crystallized first.

fig 4



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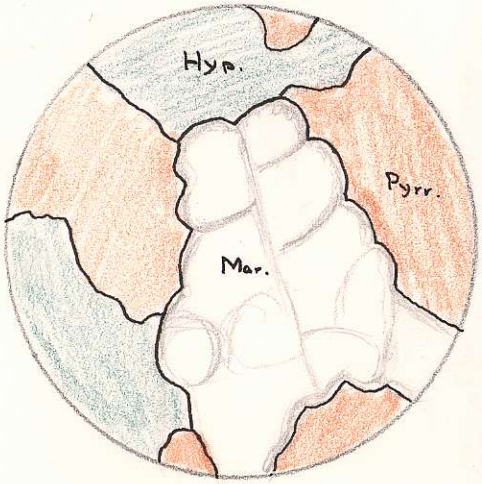
Marcasite replacing pentlandite. Note herringbone texture

fig 5



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Marcasite replacing pyrrhotite Note rounded botryoidal-type form

Type of Deposit

This deposit is a magmatic deposit. The sulphides and hypersthene probably segregated from a parent basic magma at an early stage. Crystallization of the various minerals ensued as the segregated mass began to cool

Milling of the Ore

The higher grade sections of this ore will crush fairly easily because of the abundance of brittle sulphides. However, because of the toughness of hypersthene the lower grade ore will have to have a much longer crushing time.

The majority of the sections show that 95% of the pentlandite will be separated if ~~crushed~~ ground to .3 mm, however to retrieve most of the copper values the grind would have to go to .1 mm.

In the section with the exsolution texture 75% of the pentlandite and 90% of the chalcopyrite would separate from the pyrrhotite at .25 mm. 95% of the pentlandite would be ~~g~~ recovered if ground to .08 mm.

Convert to mesh.