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MINERALOGRAPHY OF THE NAHLIN RIVER HEAZLEWOODITE LOCALITY

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Introduction

Location

The Nahlin River lies 86 miles to the south-east of Atlin, British Columbia. The area became of interest in 1956 when nickel mineralization (millerite) was discovered by Sigmund Muldal at Opal Lake. The discovery of heazlewoodite and native copper about which this report is written was also made by Mr. Muldal in 1956. The heazlewoodite occurrence is situated in a talus slide on the west side of the Nahlin River about three miles above the point where Dudidontu Creek flows into the Nahlin River.

Geology

The general geology of the area is not well known but the mineralization follows the contact of the contact between the Atlin Peridotite Belt with a band of limestone.

The peridotite has been intensely serpentized and carbonatized. The contact between the peridotite and the limestone marks a zone of extensive movement with accompanying brecciation and shearing.

Most of the specimens studied prior to the writing of this report were previously studied by Mr. A.Archer whose findings are, in the main, confirmed herein.

Megascopic

The hand specimens available were probably all from the same large piece and consisted of a highly silicified, green and black serpentine.

The weathered surface of the rock shows both cuprite and malachite which are the result of oxidation of native copper seen in the specimen.

The metallic minerals observable include native copper, magnetite and a yellowish mineral (heazlewoodite). The native copper is seen as masses up to one centimeter across while the heazlewoodite occurs in angular particles up to five millimeters across. The magnetite occurs as large (three centimeters) masses. The mineralization tends to be aligned with the direction of rock shearing and is in part itself brecciated.

Microscopic

Fourteen polished sections were examined and seven minerals were observed. These minerals and their descriptions are as follows:

Magnetite (Fe_3O_4)

Magnetite is usually seen randomly distributed throughout the serpentine as rounded grains and large masses. It is not usually seen in contact with other minerals but does occur in one place as a vermicular intergrowth in heazlewoodite. Magnetite takes a poor polish and is dark grey in colour. It is negative to all reagents except HCl which tarnishes it slightly.

Heazlewoodite (Ni_3S_2)

In polished section heazlewoodite is pale yellow with a good polish, a hardness of D and strong anisotropism from lilac to emerald green. The etch reactions are as follows: $HgCl_2$ stains brown; $FeCl_3$, KOH, KCN negative, HCl stains lightly brown; HNO_3 and aqua regia stain grey.

This mineral was positively identified by Dr. R.M. Thompson with X-ray data.

As already described heazlewoodite occurs as larger grains which have been fractured. It is often seen in contact with chalcocite, pentlandite and native copper. The fracturing has a strong tendency to follow grain boundaries.

Pentlandite $(Fe,Ni)_8S_9$

This mineral is pale yellow, takes a fair polish and is isotropic. It is always seen enclosed in heazlewoodite and is distinguished from heazlewoodite by its slightly lighter colour and isotropism as well as its etch reactions. The etch reactions for pentlandite are: $HgCl_2$, KOH, $FeCl_3$, KCN and HCl negative; HNO_3 slowly stains brown.

Chalcocite (Cu_2S)

Chalcocite takes a good polish, is blue and shows a weak anisotropism. Etch reactions are: $HgCl_2$ and KOH negative; $FeCl_3$ stains blue; KCN stains black; HCl tarnishes; HNO_3 stains blue with effervescence.

Chalcocite is usually seen in fractured grains with heazlewoodite.

Native Copper

Native copper is copperish pink to light pink in colour, isotropic and sectile. It gives the following etch reactions: $HgCl_2$ quickly stains irridescent, KOH tarnishes; KCN tarnishes lightly; $FeCl_3$ stains grey and brings out grain structure. HCl stains brown; HNO_3 effervesces and stains brown.

The wide difference in colour of the native copper is apparently due to the inclusion of nickel within the copper lattice. The native copper gives a positive microchemical test for nickel. The extremely light creamy coloured copper is usually seen rimming grains of heazlewoodite. Some of the larger grains of intermediately colored native copper showed rounded blebs and elongate masses of slightly darker native copper included within them. This is best seen with crossed polarizing prisms. An annealed texture is observable in the native copper after etching with HNO_3.

Cuprite (Cu_2O)

Cuprite was identified by its fiery red anisotropism and association. It is seen rimming native copper and on the boundaries between chalcocite and native copper.

Unknown Mineral

One grain of a creamy white mineral was seen. It is strongly anisotropic from yellow to brown and gives the following etch reactions: KOH, KCN, HCl negative; $HgCl_2$ stains brown; HNO_3 stains dark brown. These properties suggest that the mineral is rammelsbergite but the identification is not definite. Archer has reported an isotropic mineral with the same approximate etch tests but he was unable to identify it definitely.

Texture and Paragenesis

The paragenetic sequence to be given later is suggested by the following textural evidence.

Magnetite because of its distribution is presumed to be original in the rock and is therefore not considered to be part of the sequence.

Native copper is seen as small veinlets traversing through grains of chalcocite and is therefore later than chalcocite. Stringers of native copper are also seen cutting between optically oriented grains of heazlewoodite and thus is also later than heazlewoodite. Chalcocite is similarly seen passing through optically oriented grains of heazlewoodite. Pentlandite is seen invariably as rounded grains in heazlewoodite and the most likely assumption is that they are contemporaneous. The order of deposition is therefore

1. Magnetite
2. Heazlewoodite and pentlandite
3. Chalcocite
4. Native Copper

Temperature Type

The annealed texture of the native copper shows that the temperature must have been above 500 degrees Centigrade. The temperature, however, was not high enough to melt or round the sharp edges of the heazlewoodite. This suggests that the temperature was below heazlewoodite's melting temperature of 787° Centigrade. High temperature is also suggested by the inclusion of nickel in the copper lattice. At any rate the deposit is hypothermal.

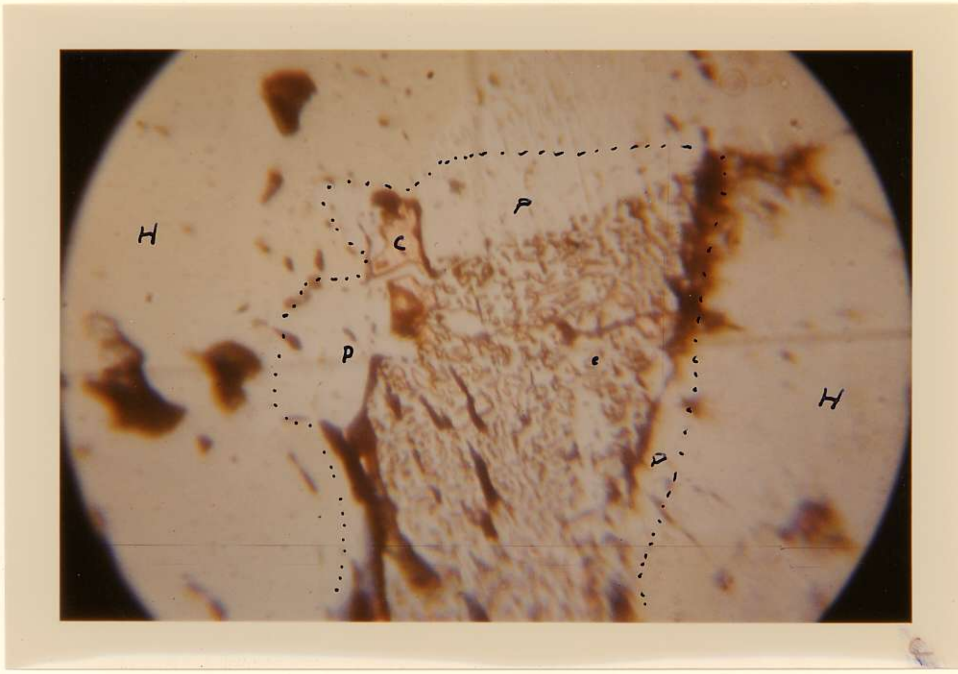

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Figure 1. Vermicular intergrowth of native copper (C) in Pentlandite (P) surrounded by Heazlewoodite (H)

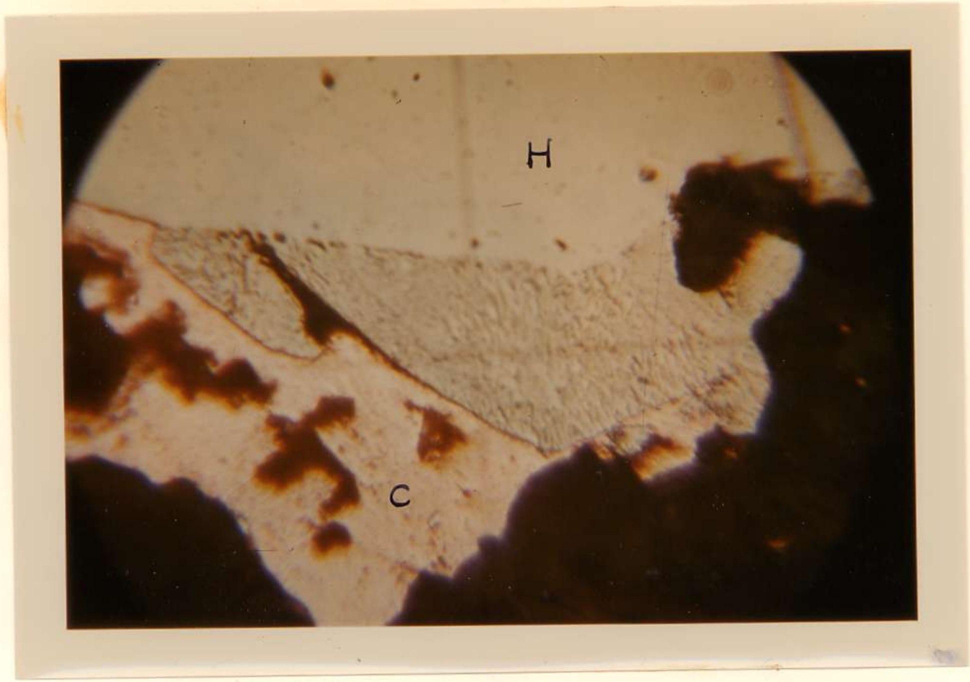

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Figure 2. Native copper (C) in contact with Heazlewoodite (H) with peculiar texture possibly due to very fine intergrowth

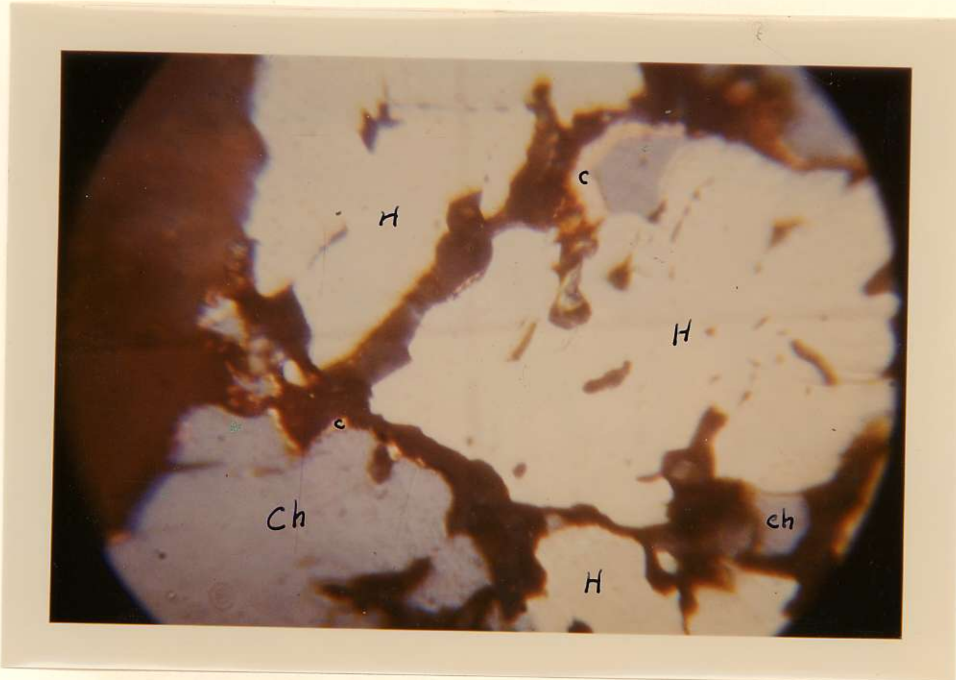

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Figure 3 Native copper (C) ~~prefe~~ replacing Chalcocite (Ch) in preference to Heazlewoodite (H)