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GEOLOGY 409

MINERALOGRAPHY REPORT NUMBER 3

OPAL LAKE AREA, B.C.

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OPAL LAKE AREA, B.C.

INTRODUCTION

The material examined for this report consisted of ten mounted polished specimens and three hand specimens. All are from the Opal Lake area southeast of Teslin Lake. Nickel finds have sparked exploration here in the past few years.

MEGASCOPIC EXAMINATION

From a megascopic examination of the hand specimens, mineralization appeared to be chiefly native copper and a yellow mineral(Millerite) in a strongly-folded serpentinized gangue. Mineralization is concentrated in the sharply folded areas of the serpentine.

MICROSCOPIC EXAMINATION

Binocular Microscope

From the examination of the specimens with the binocular microscope, three metallic minerals were observed. These were a sectile coppery-red mineral, a yellow mineral with hardness of about 5 and a blue-grey mineral.Later work with the metallographic microscope indicated these minerals to be native copper, millerite and chalcocite respectively. Native copper was in all but one of the specimens; millerite was in most; and chalcocite was found only in three of the mounted specimens.

MICROSCOPIC EXAMINATION

Binocular Microscope(cont'd)

Mineralization was located principally in pods and lens' in the crests of the folds in the serpentine. Several post-mineralization fractures were seen that indicate the intense folding occurred subsequent to mineralization.

Scale?

Metallographic Microscope

The copper-red mineral had all the characteristics(optical and physical) of either native copper(Cu) or whitneyite (Cu_9As). However, four tests for arsenic proved negative and the mineral was identified as native copper. Did you notice any change in color

x ray & microchem suggest (Cu, Ni)

The mineral identified as millerite(NiS) had all the usual optical and physical properties ~~except that~~ of millerite except that it did not have a fibrous habit. It was a pale yellow color, quite strongly anisotropic from tan-yellow to a dark color(purple?). The etch tests fitted those ascribed to millerite by M.N. Short. For texture see Figure 2.

The bluish-grey mineral has been identified as chalcocite(Cu_2S). It is not particularly abundant in the specimens, occurring usually as an associate of either the native copper or the millerite. ~~The~~ The chalcocite has been found as smooth-bordered grains within the native copper and as the ~~replacing~~ mineral replacing the millerite. (Figure 2) The chalcocite was faintly anisotropic, and conformed to the etch tests as described by Short.

OPTICAL DATA and ETCH TEST REACTIONS

NATIVE COPPER (Cu)

Smooth polish, slight scratches by abrasive. Coppery-red color. Hardness of B. Very sectile. Isotropic and non-pleochroic.

Etch test results are:

$HgCl_2$	irridescent stain.
KOH	negative
KCN	brown tarnish
$FeCl_3$	quickly darkens
HCl	slight stain
HNO_3	brown stain, effervesces

Microchemical tests for copper were positive, for arsenic negative.

MILLERITE (NiS)

Good polish. Pale yellow color. Hardness of E. Anisotropic from tan-yellow to dark, non-pleochroic.

Etch tests results are as follows:

$HgCl_2$	negative, sometimes a slight brown stain
KOH	negative
KCN	negative
$FeCl_3$	negative
HCl	negative
HNO_3	brown stain

OPTICAL DATA and ETCH TEST REACTIONS

CHALCOCITE (Cu_2S)

Fair to good polish. Blue-grey color. Hardness of about C. Faintly anisotropic from grey-black to brown. Non-pleochroic.

Etch tests and microchemical tests results are:

$HgCl_2$	slight brown tarnish
KOH	negative
KCN	immediately black, etch cleavage develops, pitting
$FeCl_3$	stains dark quickly
HCl	negative
HNO_3	blue tarnish, effervesces

Aqua Regia negative

Microchemical test for copper was positive.

Also heazelwoodite - Ni_3S_2 yellow white mod-strong anisotropism.

PRIMARY MINERALS

Copper (Cu) 2.9%

Millerite (NiS) 3.2%

SECONDARY MINERALS

Evidence?

CHalcocite (Cu_2S) 1.3% (for 3 sections)

The above percentages are calculated from the averages in the ten mounted specimens. Average grain sizes for the minerals are as follows:

Copper ~~7.0~~ 0.7 mm.

Millerite ~~1.2~~ 0.12 mm.

Chalcocite ~~1.0~~ 0.1 mm.

TEXTURES AND PARAGENESIS

The country rock in the specimens is a highly contorted serpentine. Mineralization appears to be localized along fractures or in areas of extreme contortion such as the crests and troughs of the many small folds.

The copper can be described best as having a sieve texture. The boundaries of the copper grains are very irregular and seriate. The appearance of the boundaries could be compared to ~~the~~ those of drops of molten lead that have splattered on a smooth surface and cooled. In Figure 1, an unusual feature is found in the copper grain in the lower central part of the figure. Polygonal-- usually hexagonal-- cracks or fractures are found are very similar in appearance to mud-cracks. This feature could be the result of dehydration of a colloidal gel. original "dendritic" form of a native metal?

The millerite occurs as brecciated, subangular grains..Most of the millerite grains show a faintly crenulated surface that is particularly noticeable immediately before extinction under crossed nicols. These wrinkles are roughly parallel to the larger lineations in the serpentine and if they can be construed as stress features, then they are an indication that the millerite was emplaced before folding commenced. Another indication that the millerite was deposited prior to folding and brecciation are the aggregates of grains that

TEXTURE AND PARAGENESIS

extinguish simultaneously under crossed nicols. These aggregates are probably the remains of grains that have been brecciated and replaced to a certain degree.

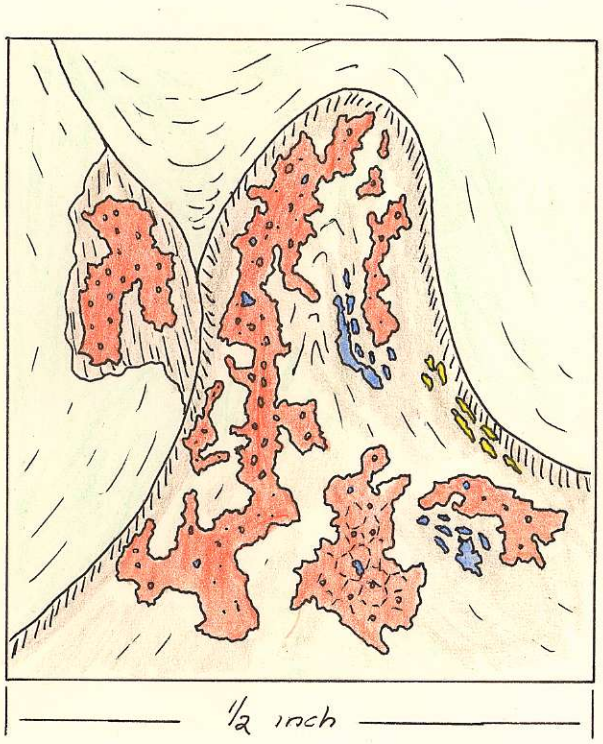
The chalcocite is found as scattered grains usually in proximity to the native copper or the millerite. In some cases the chalcocite appeared to be replacing the millerite (see figure 2), or occupying positions that should be occupied by millerite. Frequently the chalcocite is found as grains within the native copper.

A suggested paragenetic sequence can be made from an interpretation of the textures. Originally, the country rock was a basic rock, probably a gabbro or a norite that carried copper and nickel as accessories. These metals have been concentrated and sulfur and silica have been introduced. The source of the sulfur and the silica is unsure, but they might have been introduced by aqueous solutions that tended to enrich the copper and the nickel and redeposit them as native copper, millerite and chalcocite. Following the supposed enrichment by solutions was a period of intense folding that had the effect of further concentrating the minerals, mainly in areas of great deformation. The chalcocite may be the result of combination of the introduced sulfide waters and the native copper or it may be the result of replacement of the native copper and the millerite.

TEMPERATURE OF FORMATION

The conclusions drawn in the preceding paragraph favour deposition of the minerals in a low temperature medium, probably at relatively shallow depths. That is , deposition under epithermal conditions.

RMT
March 23/59



Native Copper

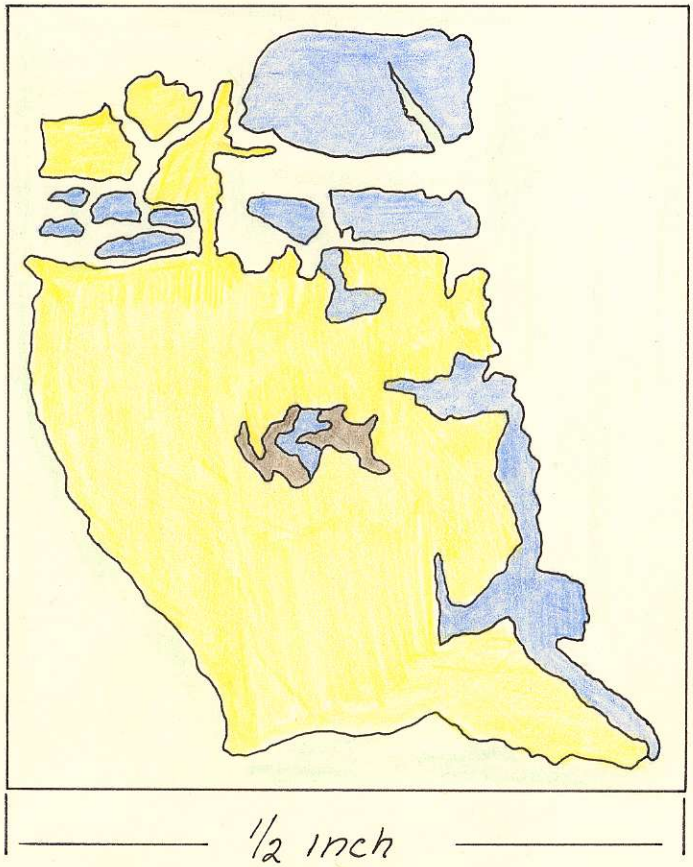
Millerite

Chalcocite

Quartz

Serpentine

Figure 1



Millerite

Chalcocite

Serpentine

Quartz

Figure 2