Descriptions poor.

A MINERALOGRAPHIC STUDY OF THE CANAM COPPER ORES

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GEOLOGY 409

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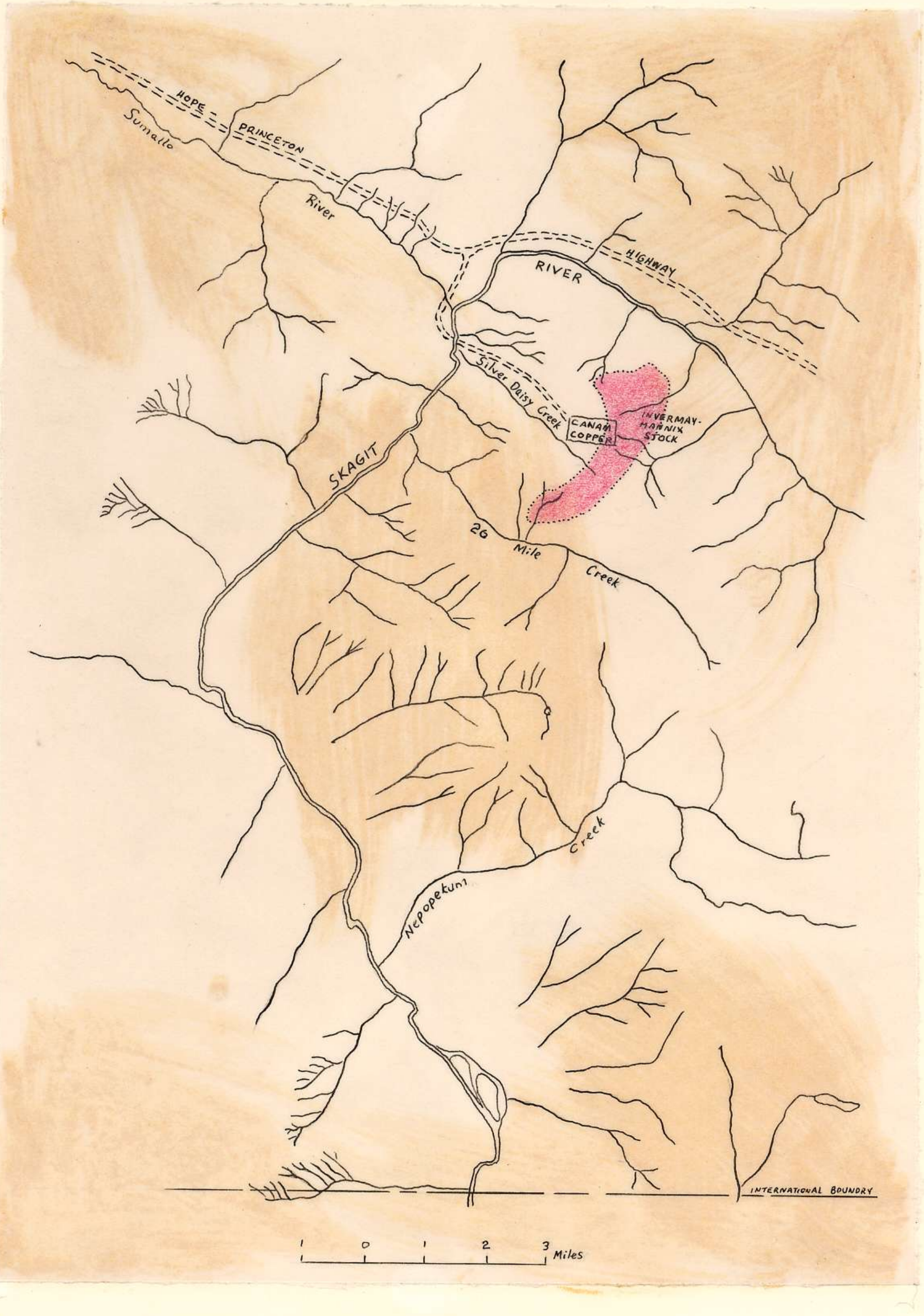

fig. 1 location map of Canam Copper deposits

North?

A MINERALOGRAPHIC STUDY
OF THE
CANAM COPPER ORES

INTRODUCTION

Purpose of the work

A study of the Canam Copper ores was made for the following reasons:

(1) To provide a summary of evidence bearing on the genesis of the deposit.

(2) To collect information leading to the temperature and conditions of deposition so that the deposit might be classified.

(3) To investigate the relationship between the mineralization in the quartz diorite stock and that in the brecciated Dewdney sediments.

(4) To determine the effect the gangue minerals have in relation to the metallics.

Location

Twenty-seven miles southeast of Hope in the Yale mining district, the Canam Copper Co. holds forty-eight claims comprising both the Invermay and A. M. groups. The property is located about five miles off the Hope-Princeton highway at the head of Silver Daisy Creek, a northeastward flowing tributary of the Skagit River. Access to the property is gained by an all weather, gravel road which meets the Hope-Princeton highway.

Mining History

The initial discovery in the area took place in 1930. In 1932, Consolidated Mining and Smelting located claims on the A. M. group and began exploration work the same year. Work continued on the property until 1938 when operations were suspended.

Similarly, the Invermay Mannix Mining Co. located claims next to the A. M. group in 1933 but with exception of a shipment of ore to Trail in 1936 were able to locate and extract little ore. Consequently, they too were forced to discontinue operations in 1938.

In 1948, the newly formed Canam Mining Company picked up the option for both properties and resumed work in the area. In 1952, the holdings were transferred to the Canam Copper Company, a subsiduary formed to develop the property. Subsequently, in July of 1954 directors of Canam Copper ratified agreement whereby the American Metal Co. of New York would proceed with the development of the property. This work continues to a limited extent today.

Mogul entered picture - present status ?

GENERAL GEOLOGY [1]

The Canam Copper claims are underlain by rocks of the Dewdney Series which are Jurassic in age. These are primarily tuffaceous rocks interbedded with slightly calcareous, fine grained argillites and some cherts, striking N 30° W and dipping at high angles to the southwest.

The structure of the area is somewhat complicated by both high and low angle faults in addition to intrusive hornblende lamprophyre sills and other less basic feldspar porphyry dykes.

Two thousand feet north of the mineralized area, the Dewdney rocks are intruded by a light coloured quartz diorite stock which is composed of quartz, plegioclese, hornblende, biotite and a little orthoclase. This mass, which intruded the sediments in late Cretaceous time, is probably related genetically to the Canam Copper deposit.

Ore also occurs within the stock in a lighly altered shear zone while the ore of the Dewdney sediments lies in a breccia.

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1. Cairnes, C. E.: "Geological Explorations in Yale and Similkameen mining divisions, southwestern B. C.", Summary Report, 1922, Part A, pp 96 - 107

MINERALOGY

The striking difference between the ore of the Invermay-Mannix stock and that of the Dewdney sediments is the relative amounts of tourmaline, arsenopyrite, and pyrrhotite in the two deposits. Tourmaline and arsenopyrite are dominant and pyrrhotite is minor in the stock while in the brecciated sediments the reverse is true.

Gangue Minerals

Tourmaline:

Tourmaline occurs as long fibrous crystals as well as spherulitic aggregates (tourmaline suns). It is typically triangular in cross-section and was probably formed by the introduction of Boron gas which metasomatically altered the feldspars of the stock (fig. 5) and sediments.

Axinite:

Axinite is found in the sediments but has not been reported in the stock. It appears to have been formed contemperaneously with tourmaline, probably by a similar process; that is, the alteration of the calcareous fractions of the Dewdney sediments by the addition of Boron gas.

Chlorite:

Chlorite appears in the brecciated sediments as an alteration product of the tuffs and argillites. It is present in both the fragments and matrix of the breccia where it is strongly associated with tourmaline and axinite.

Quartz:

Hydrothermal quartz is present in the stock as well as the sediments and in both places exhibits a distinctive comb texture. In places it cements fractured axinite crystals

Orthoclase:

Some orthoclase, apparently of hydrothermal origin was recognized in a thin section of the breccia.

Calcite:

Late hydrothermal calcite of a fine grained nature replaces axinite along its cleavage planes and otherwise is scattered sporadically throughout the matrix of the brecciated Dewdney sediments.

Metallic Minerals

Arsenopyrite:

This mineral is widespread in both the stock and the sediments but is particularly dominant in the former. It occurs primarily as fine grained, massive, irregular bodies and to a minor extent as typical pseudo-rhombehedral crystals. It undoubtedly is one of the earliest metallic minerals since it is replaced by most of the sulphides (fig. 3). Of particular interest is its intimate association with tourmaline and its presence in both the matrix and fragments of the breccia. Triangular tourmaline crystals are enveloped in places by a rim of arsenopyrite. Furthermore, arsenopyrite fills fractures which bisect tourmaline prisms (fig. 3).

Pyrite:

Pyrite in the stock and sediments exhibits two distinct textures. In the former, the mineral is largely massive and very fine grained while in the latter rock, pyrite occurs as large enhedral cubes which appear to be slightly more yellow than the massive material. Arsenopyrite and pyrite have a mutual boundry texture in the ore of the stock but nevertheless the pyrite is considered a little older because of its absence in the fragments of the Dewdney Series breccia. It is likely that pyrite began to deposit when arsenic no longer was available to form arsenopyrite.

Sphalerite:

Massive, dark grey sphalerite occurs extensively in the Invermay Mannix stock but is present only in minor amounts in the breccia. It replaces arsenopyrite (fig. 3) and pyrite and also forms rims around triangular tourmaline crystals.

Pyrrhotite:

A considerable amount of massive pyrrhotite forms part of the matrix of the Canam Copper breccia. However, a few well developed crystal faces occur at random throughout the ore. In the stock, where it is relatively scarce, pyrrhotite replaces pyrite leaving merely relict rims.

Chalcopyrite:

Chalcopyrite, the most common sulphide in the area, is found in fairly large quantities in both rocks. It is characteristically massive and is intimately associated with pyrrhotite which it replaces (fig. 4). Since it replaces most of the other sulphides (figs. 2 & 3), it is considered one of the latest minerals deposited.

Galena:

Galena occurs in minor amounts on both properties where it seems to be associated with chalcopyrite. It is present largely as small isolated grains and although difficult to determine, it appears to replace chalcopyrite.

Marcasite:

Marcasite rarely appears as colloform rims on pyrrhotite.

Covellite:

Covellite occurs as an alteration product of chalcopyrite.

Paragenesis

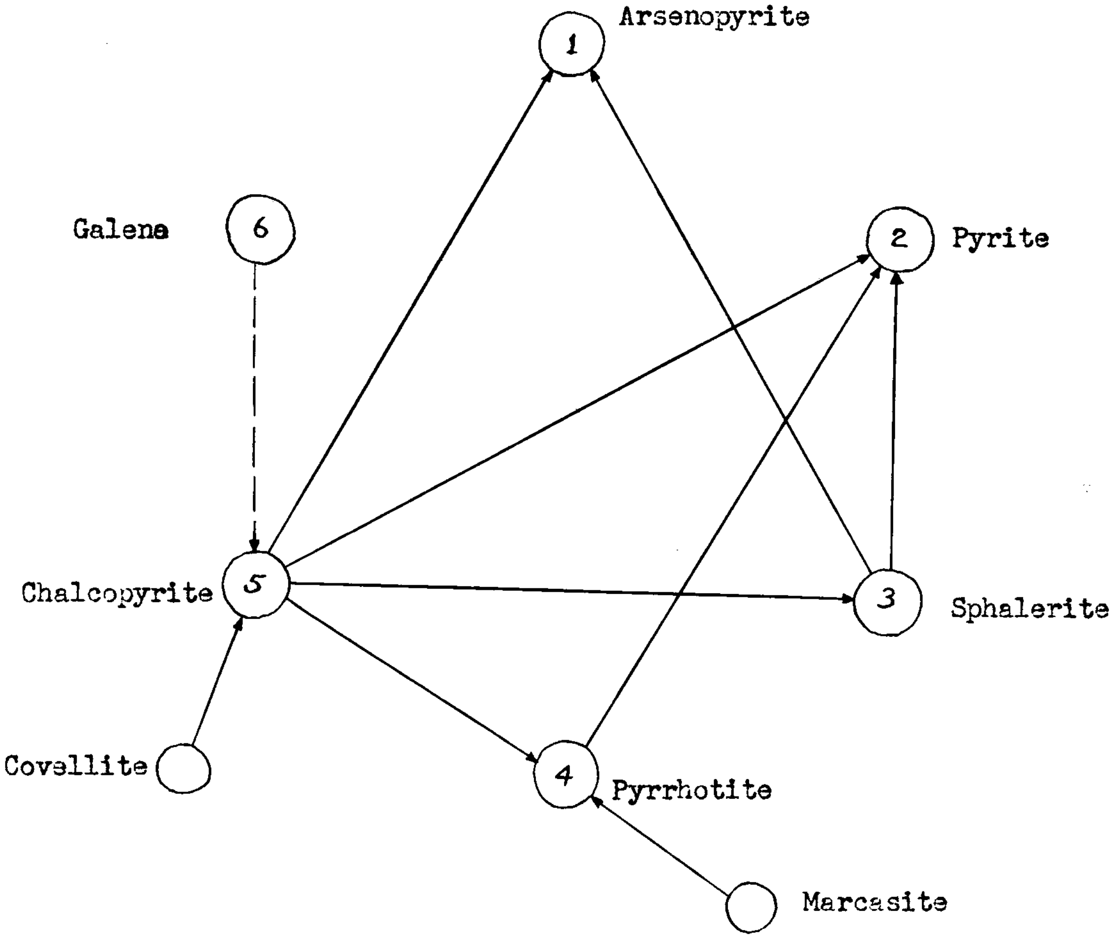
The minerals determined in this investigation are given here in there approximate order of deposition.

Primary	Secondary	Gangue
Arsenopyrite	Marcasite	Tourmaline
Pyrite	Covellite	Axinite
Sphalerite		Chlorite
Pyrrhotite		Quartz
Chalcopyrite		Orthoclase
Galena		Calcite

The sequence of deposition is difficult to assess, particularly with respect to the gangue minerals. Hydrothermal quartz injected into the tourmalinized quartz diorite has intermixed with residual quartz. Consequently the genetic occurrence of the quartz is difficult to determine. The brecciated and sheared nature of the Canam Copper ores has made the paragenetic sequence somewhat difficult to ascertain. It is probable that some of the phases are transitional and overlapping. However, the sequence of events in the deposition of the ores related to the quartz diorite stock appears to have been as follows:

(1) The metasomatic replacement of feldspars and the calcareous material to form tourmaline and axinite respectively. The resulting rock was sheared as indicated by the fracturing of tourmaline prisms.

(2) Hornblende and biotite in the quartz diorite and most of the Dewdney sediments were altered to chlorite to a limited extent. Arsenopyrite



Paragenesis chart of the metallic minerals was introduced into these fractured and altered rocks, in places cementing the fractured tourmaline. This phase was terminated by the further shearing of quartz diorite and the brecciation of the Dewdney rocks.

(3) Into these sheared and brecciated rocks, hydrothermal quartz and feldspar were introduced followed by pyrite, sphalerite, pyrrhotite, chalcopyrite, galena and calcite in the order shown. These ore minerals appear to have had a preference for replacing the softer, argillaceous matrix of the breccia, leaving much of the tuff and chert untouched by mineralizing solutions.

CONCLUSIONS

Although both genetically related to the quartz diorite stock, the ore deposits within the stock and those in the Dewdney breccia nevertheless bear distinctive differences in textures and mineralogy.

The ore in the stock is largely representative of a vein deposit and is characterized by the intense tourmalinization of the feldspars of the host rock. Because arsenopyrite is intimately associated with tourmaline, it follows that most of the arsenopyrite in the area would be present in the stock. It is felt, furthermore, that temperature and pressure conditions were somewhat higher here than in the surrounding sediments due to the proximity of the stock and the relative tightness of the fissures of the sheared stock.

In contrast, the ore within the breccia is chiefly a product of replacement processes. Since little feldspar occurred in the original Dewdney sediments, tourmalinization was limited. It is postulated that pyrrhotite was deposited from arsenic barren solutions after most of the arsenic was used in the formation of arsenopyrite.

The presence of arsenopyrite, tourmaline and pyrrhotite in the Canam Copper hydrothermal deposits is indicative of a temperature of formation is excess of 500° C.[2] This criteria coupled with hydrothermal fissure filling textures exhibited by the ore are indicators of the hypothermal class of Lindgren.

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2. Edwards, A. B.: "Textures of the Ore Minerals," Australasian Institute of Mining and Metallurgy, Melbourne, 1947.

APPENDIX

fig. 2 - magnification 75X - Chalcopyrite (C) replacing sphalerite (S) and arsenopyrite (A). Arsenopyrite rims tourmaline (T) and quartz (Q).

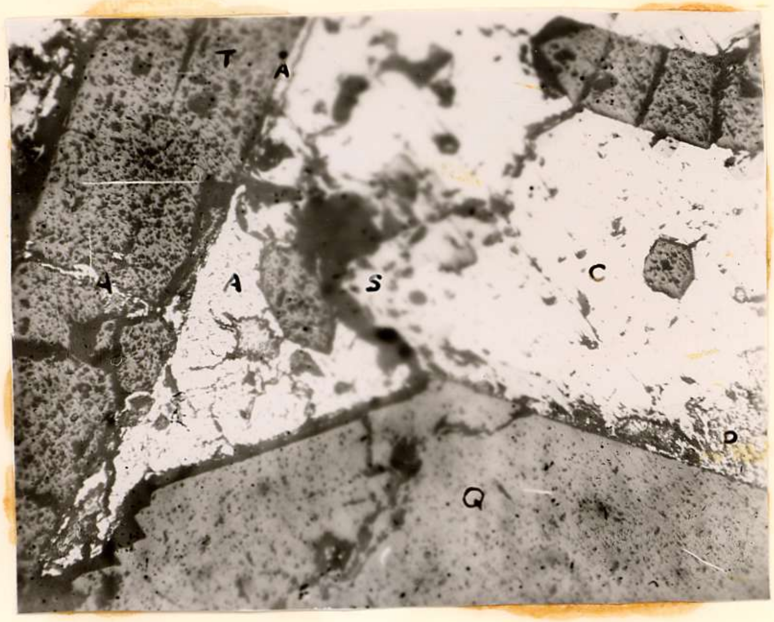

fig. 3 - magnification 75X - Chalcopyrite (C) replacing sphalerite (S), pyrite (P) and arsenopyrite (A). Arsenopyrite cutting tourmaline (T) and abutting quartz (Q) crystal.

APPENDIX

fig. 4 - magnification 75X - Chalcopyrite replacing pyrrhotite with quartz

fig. 5 - actual size - Tourmaline replacing feldspars of the quartz diorite

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