600076

MICROSCOPIC EXAMINATION OF POLISHED SECTIONS

MORRIS MINE

TATLAYOKA LAKE, B.C.

BY

H.R. MACRAE

THE UNIVERSITY OF BRITISH COLUMBIA

APRIL 1943

ACKNOWLEDGMENTS

The writer would like to acknowledge the generous co-operation which he has received from Dr. H.V. Warren and Mr. James Donnan, in the preparation of this report.

BIBLIOGRAPHY

Short, M.N., Microscopic Determination of the Ore Minerals. U.S.G.S., Bulletin 914. 2d ed.

British Columbia Department of Mines, Annual Report of Minister of Mines, 1935, Part F, pp. 29.

INTRODUCTION

The Morris Mine, a property of the Bridge Island Golds, Limited, is at the south end of Tatlayoka Lake, British Columbia. The area is accessible by motor road, and is 165 miles south and west of Williams Lake on the Pacific Great Eastern Railway.

The mineralization at this property is in quartz veins in Triassic sediments, and in fractures in a quartz diorite sill, related probably, to the Coast Range Batholith. These veins contain considerable amounts of stibnite and arsenopyrite, with lesser amounts of tetrahedrite, pyrite, and sphalerite.

Prior to the present war, the value of the property was considered to lie in the gold and silver content of the ore. This is as much as one ounce per ton of gold, and twenty-two ounces per ton of silver. However, under present conditions the large amounts of stibnite in the ore have become of prime importance.

The writer has examined three polished sections prepared from ore specimens of this property. The object of this examination was to determine the feasibility of milling the ore and separating the arsenopyrite from the stibnite.

Preparation of Sections

Three hand specimens, numbers 4, 5, and 20, collected by Dr. H. V. Warren, were selected from the laboratory collection. In all his work with these specimens, including references to them in this report, the writer has retained these numbers.

A section about one quarter of an inch thick, and three quarters of an inch square, was cut from each hand specimen with a diamond saw. All fragments of the same specimen were placed in labled trays for future reference.

One inch lengths of $1\frac{1}{4}$ inch by $1\frac{1}{2}$ inch brass tubing were used as mounting boxes for the specimens. Both sections and mounts were given a preliminary heating, after which, the sections were placed on a piece of smooth paper lying on a glass plate, with the mounting boxes around them. Next a mixture of demar gum, shellac, and turpentine, heated to the proper consistency, was poured around each sections until the mounting boxes were about one half full. The demar was then allowed to harden. Finally, plaster of Paris was used to fill the mounting boxes completely.

The grinding and polishing of the sections falls into three stages. First, the sections are ground on a low speed lap using corundum powder as an abrasive. Secondly aloxite abrasive is used, first on a medium speed power lap, and then by hand on a glass lap. Lastly, chromic oxide is used on a billiard cloth lap, to give the sections a final polish.

EXAMINATION OF SECTIONS

The three sections, prepared as above, were examined under a metallographic microscipe to determine the minerals present, and their size and distribution. When necessary, microchemical, and etch tests were used. The results of this examination are given below for each section.

Section #4

The mineralization in this section is entirely quartz and stibnite. The quartz is grey in colour and is intensely fractured. The stibnite occurs in the fractures of the quartz and has replaced it to a considerable extent. To facilitate the examination, the writer etched the whole surface of the stibnite with potassium hydroxide. This treatment, which is actually the microchemical test for stibnite, turned the surface of the mineral a bright orange colour, making it more easily discernable. As the stibnite is in interconnected patches rather than in individual grains, the writer found great difficulty in estimating the amount of stibnite present and the average size of the patches. However, the section probably contains between 20 and 25 percent stibnite of which perhaps 80% could be unlocked by grinding to 20/mesh.

Section #5

The most prominent mineral in this section is arsenopyrite, which occurs in zones following the fractures of the quartz. The arsenopyrite appears to have been brecciated at some stage of its crystallization, and now appears as groups of diamond and rectangular shaped crystals many of which appear to have matching sides and angles, showing that they originally formed one crystal. These crystals are of all sizes up to 0.07 inches across. There are also minute amounts of arsenopyrite in the quartz away from these main zones. These smaller grains are barely visible, using the high power objective lens on the microscope. The writer at first thought these last mentioned grains to be gold, but when tested with nitric acid they appeared to stain a purple colour.

Tetrhedrite is present in this section, veining and partly replacing arsenopyrite. It seldom occurs away from the arsenopyrite and in the few such cases observed, it only does so in minute amounts. The largest single patch of tetrahedrite observed was 0.04 inches across.

Pyrite is also present in this section being found in minor amounts with the arsenopyrite.

There is a possibility that there are two generations of quartz in the section. As stated before, the arsenopyrite is found in the fractures of the main quartz matrix. However, several of the arsenopyrite crystals appear to be veined by a hard quartz-like mineral, which is negative to all etch tests.

The section contains about 20 percent arsenopyrite, and about one percent of tetrahedrite. No gold could be identified definitely, although it is possible that some of the minute grains which have been included above as arsenopyrite, are actually gold. It should be noted, that in contrast to section #4, this section contains no stibnite whatever.

Section #20

The mineralization in this section represents a combination of the two sections described above . Stibnite and arsenopyrite are the most prominent minerals, occuring in a finely fractured quartz matrix. However it should be noted that the two are quite separate from each other, the stibnite being confined to one half of the section, while the arseno-pyrite forms a band of brecciated crystals traversing the other half. As in section #5, tetrahedrite veins the arseno-pyrite and minor amounts of pyrite are present. Again, no gold could be definitely identified.

The occurrence of stibnite in this section is similar to that in section #4; that is, in the zone in which it occurs, it is the only sulphide present.

Sphalerite was found in the section, an arc-lamp being used in order that its characteristic amber internal reflection could be observed. Only several grains of it are present and it is isolated from the other sulphides.

Methods of Mineral Identification

The minerals noted in the above section were identified as follows:

1. Stibnite

   (a) Soft.

   (b) Orange colouration when tested with KOH.

2. Arsenopyrite

   (a) Hard

   (b) High relief

   (c) Characteristic diamond shaped crystals

   (d) Purple irridescent staining with HNO_3.

3. Tetrahedrite

   (a) Isotropic

   (b) Soft

   (c) Grey colour

   (d) Stain brown with KCN (very slowly)

   (e) HCl, $FeCl_3$, KOH, and $HgCl_2$, all negative.

   (f) Positive microchemical test for copper.

4. Pyrite

   (a) High relief

   (b) Negative to all etch reagents.

5. Sphalerite

   (a) Amber internal reflection when section illuminated by an arc lamp.

Conclusions:

1. The stibnite and arsenopyrite as observed in these sections, are separate from each other, and could be milled to produce separate concentrates.

2. About 80% of the stibnite present could be unlocked by grinding the ore to 20 mesh.

3. Samples of this ore, when assayed, have been shown to contain as much as one ounce per ton of gold. Gold, if it is present in these sections, probably occurs with the arsenopyrite.

4. The tetrahedrite, in nearly every instance, is associated with the arsenopyrite, and is never found with the stibnite.

5. Sphalerite is present, but only in negligible amounts.