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MINERALOGICAL INVESTIGATION OF A MOLYBDENUM-BISMUTH ORE FROM THE PREISSAC AREA IN QUEBEC FOR MOLY HILL MINING CORPORATION

by

W. PETRUK

MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

A mineralogical study of a molybdenum-bismuth ore from the Preissac area in Quebec was made in connection with beneficiation tests being conducted in the Mineral Processing Division. The ore minerals occur in quartz as irregular grains and masses from about .05 to 5 mm in diameter, and consist of molybdenite, bismuth-bearing minerals, chalcopyrite and galena. The bismuth-bearing minerals are bismuthinite, emplectite, native bismuth, bismutite, bismite, and arsenobismite. In addition, two unidentified minerals are present and they are also assumed to be bismuth-bearing minerals.

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INTRODUCTION

A sample of molybdenum-bismuth ore from the Preissac area in Quebec was received from G. Mathieu of the Mineral Processing Division. Mr. Mathieu stated that the ore had been submitted to the Mines Branch by Moly Hill Mining Corporation Limited, 146 Main Street, Rouyn, Quebec, and requested that it be investigated mineralogically. The sample received consisted of pieces about $\frac{1}{4}$ to 1 inch in size.

METHOD OF INVESTIGATION

The sample was hand picked and 3 polished sections were prepared from the selected mineralized pieces. The minerals in the polished sections were then identified by microscopical and X-ray diffraction studies.

RESULTS OF INVESTIGATION

The sample consists of two general types of material: a coarse-grained assemblage consisting of feldspar, colourless mica, and mineralized quartz; and a medium-grained rock composed of quartz, feldspar biotite, pyroxene and amphibole. The mineralized quartz contains grains

and masses of molybdenite, bismuth-bearing minerals, chalcopyrite and galena. The molybdenite (MoS_2) is present as bundles of flakes (Figure 1) and is relatively free of impurities. The bundles vary from about 0.1 to 5 mm in size.

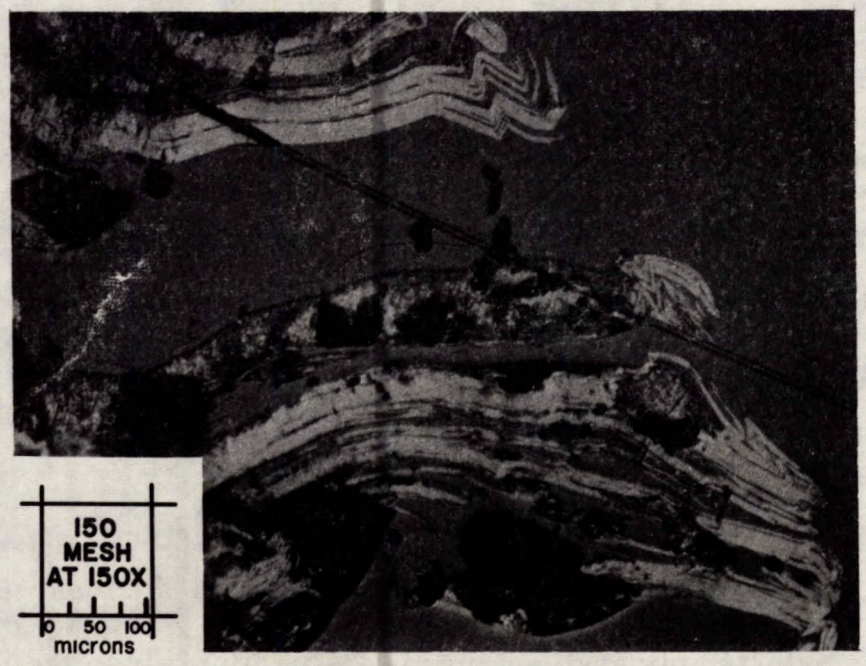

Figure 1. Photomicrograph of a polished section showing a bundle of molybdenite flakes.

The bismuth-bearing mineral grains and masses vary from about 0.1 to 5 mm in size, and are composed of bismuthinite (Bi_2S_3), emplectite ($BiCuS_2$), two unidentified minerals, native bismuth (Bi), bismutite ($(BiO)_2CO_3$), bismite (Bi_2O_3) and arsenobismite ($Bi_2AsO_4(OH)_3$). Bismuthinite is the principal bismuth-bearing mineral. It occurs largely as irregular masses and contains irregular grains of an unidentified mineral (Figure 2) and emplectite. The unidentified mineral is buff in reflected light and is strongly anisotropic. Its X-ray diffraction pattern is similar

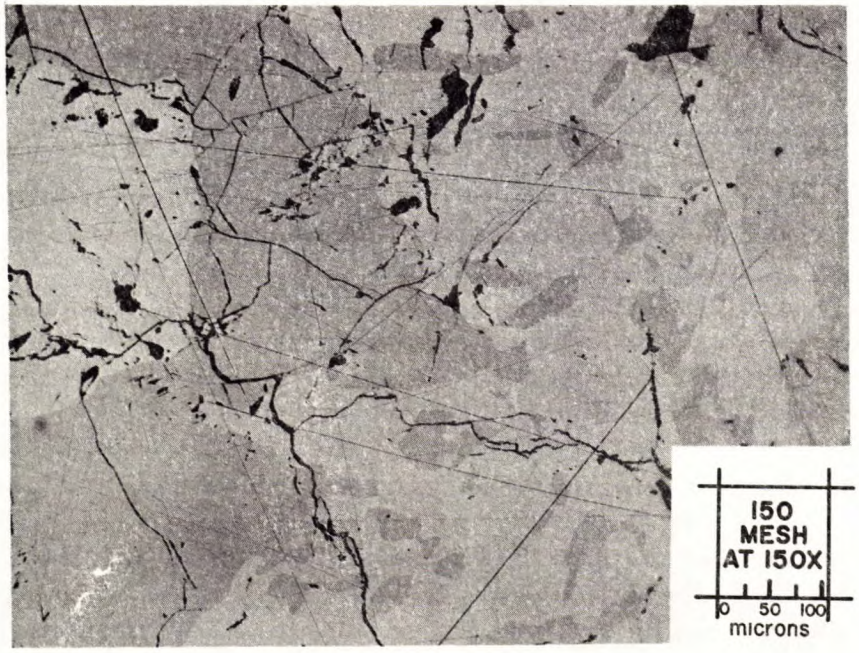

Figure 2. Photomicrograph of a polished section in immersion oil showing bismuthinite (white) with irregular grains of the unidentified mineral (light grey).

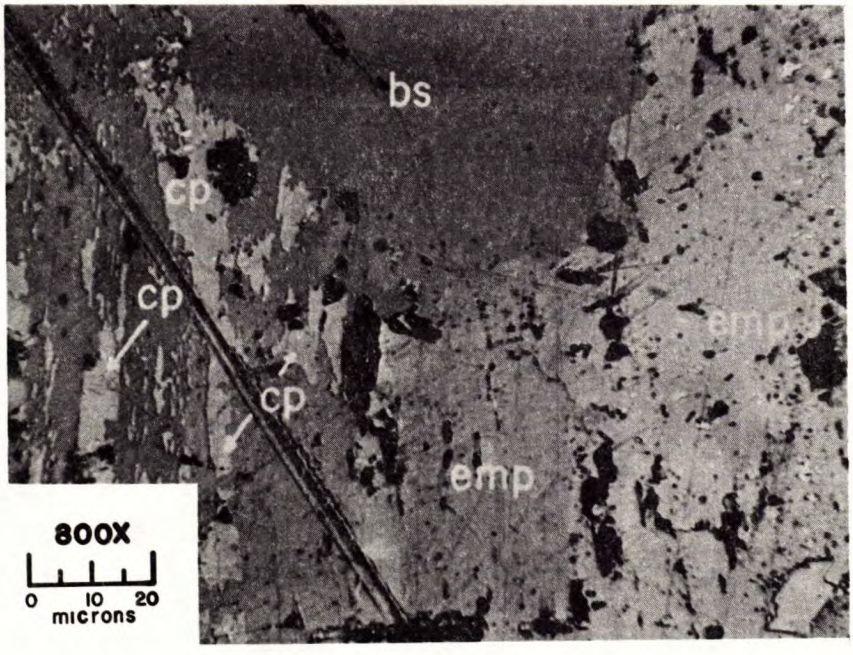

Figure 3. Photomicrograph of a polished section at high magnification in immersion oil showing part of an emplectite grain (emp) and some bismuthinite (bs). The emplectite contains chalcopyrite (cp) and native bismuth (small white spots at the right side of the photograph). The wide line cutting diagonally across the photomicrograph represents a scratch on the polished section.

to that of a mixture of bismuthinite and arsenobismite but it could not be correlated to that of any known mineral. The emplectite contains minute grains of native bismuth, chalcopyrite ($CuFeS_2$) (Figure 3) and another unidentified mineral. This unidentified mineral is present only as minute grains too small to be dug out for X-ray diffraction study. It is strongly bireflecting, varying from white to bluish-grey in reflected light, and is strongly anistropic.

The bismuth-bearing mineral grains and masses are altered to bismite, bismutite and arsenobismite along the edges and fractures (Figure 4). In some places this altered zone contains minute grains of native bismuth.

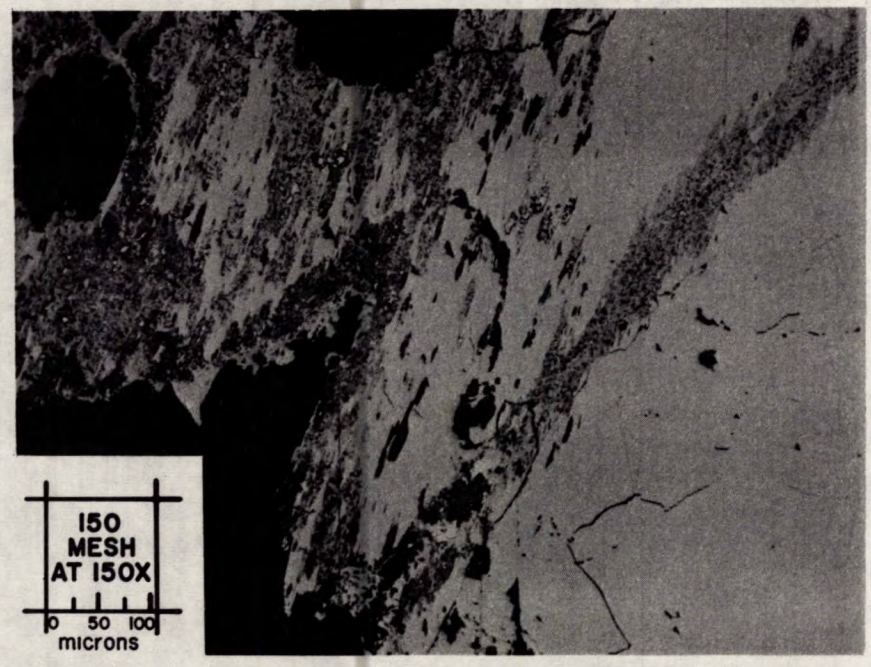

Figure 4. Photomicrograph of a polished section in immersion oil, showing part of a bismuthinite grain (white) altered to bismite, bismutite and arsenobismite (shades of grey). The small white spots in the altered bismuth-bearing mineral at the left side of the photograph represent native bismuth.

A few grains of chalcopyrite and galena (PbS) are present in the ore. Some of the galena contains inclusions of native bismuth and some is intergrown with chalcopyrite.

CONCLUSIONS

The ore minerals are present as relatively large grains and it is expected that most of them would be liberated at a grind of about -100 mesh. It is further expected that the liberated molybdenite grains should be relatively free of impurities. The bismuth-bearing mineral grains, on the other hand, are likely to consist of bismuthinite, the unidentified mineral, and emplectite, and would contain inclusions of native bismuth, chalcopyrite, and the secondary bismuth-bearing minerals. These secondary minerals may interfere, to a small extent at least, in the beneficiation of bismuth.

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