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MINERALOGICAL EXAMINATION OF A Cu-Pb-Zn-Ag ORE SUBMITTED BY MATTAGAMI LAKE MINES LTD., FROM THEIR STURGEON LAKE, N.W. ONTARIO DEPOSIT

by

R. G. PINARD

MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

The principal ore minerals are massive pyrite and sphalerite, and coarse-grained pyrrhotite and magnetite. Chalcopyrite and galena are next in abundance. There are lesser amounts of marcasite, siderite, ilmenite, rutile, arsenopyrite, and silver-bearing tetrahedrite, (freibergite), listed approximately in decreasing order of abundance. The major gangue mineral is quartz, and there are minor mica and chlorite. Other minerals present are dolomite and a zinc-bearing spinel.

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*Technician, Mineralogy Section, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

INTRODUCTION

Fragments of split diamond drill core and a package of minus 10-mesh head sample, both designated as Sample F-1, were received from Mr. A. Stemerowicz (Mineral Processing Division) on January 14, 1970. The core and head sample were stated to have come from a Cu-Pb-Zn-Ag ore submitted by Mattagami Lake Mines Ltd. from a deposit at Sturgeon Lake, in northwestern Ontario. The sample submitted to the Mineral Processing Division had consisted of 115 lb. of coarsely crushed, diamond-drill core rejects, with an approximate analysis of 8.75% zinc, 0.75% copper, 1.0% lead and 4.0 oz./ton silver.

METHOD OF INVESTIGATION

Four polished sections for microscopic study were prepared from thirteen representative fragments of the diamond-drill core rejects. The -48+100 and the -100+200 fractions of the head sample were separated using heavy liquids with specific gravities of 2.96, 3.3 and 3.7; the sink products at 3.7 were further separated into sub-fractions magnetically using a hand magnet and the Frantz magnetic separator. Polished sections were then prepared from several of these sub-fractions. The hand magnetic fraction was subjected to X-ray diffractometery to determine the ratio of monoclinic to hexagonal pyrrhotite. The minerals were identified by microscopy, X-ray diffraction analysis (Mr. E.J. Murray of the Crystal Structure Group) and electron-probe microanalysis (Mr. D.R. Owens of the Mineralogy Section).

RESULTS OF INVESTIGATION

The diamond-drill core samples consisted principally of sulphides with minor gangue; a few of the core fragments were attracted to a hand magnet and contained mainly pyrrhotite and magnetite, while a few others contained mainly gangue minerals.

Pyrite, sphalerite, pyrrhotite and magnetite all occur in major amounts. Much of the pyrite is massive, but some also occurs as grains varying in size* down to about 10 microns. The pyrite appears to be associated with all the other ore minerals**.

The great majority of sphalerite occurs in massive form (Figure 1), but a relatively minor amount is also present as disseminated grains, which vary in size from several millimeters to less than 5 microns. It occurs as inclusions in pyrite, as isolated grains, and in veins associated with the gangue minerals (Figure 2). Electron-probe analyses showed the sphalerite to vary in Fe content from a high of about 8.1% to a low of about 6.3%. The majority of the pyrrhotite is relatively coarse, with grains up to about 1 millimetre in size; it is frequently found associated with magnetite. The pyrrhotite appears to be mainly of the magnetic monoclinic variety. The magnetite grains vary in size from 1 mm down to very fine-grained inclusions of about 5 microns in size.

The next most common ore mineral is chalcopyrite, most of which is relatively coarse, but some of which occurs as fine-grained inclusions down to about 10 microns. It appears to be associated with all other ore minerals. The galena is more fine grained, (Figure 3), with a maximum grain size of about 800 microns. It is generally associated with pyrite, chalcopyrite, and

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*The word "size" as used in this report refers to the greatest dimension of the grain.

**The term "ore mineral" as used in this report does not necessarily have an economic connotation.

sphalerite. Marcasite was found in a few of the polished sections with grain size varying from 300 microns to less than 10 microns.

The major gangue mineral is quartz, although minor amounts of mica and chlorite were also observed. Other minerals occurring in small amounts and found in a few of the samples are tetrahedrite, siderite, ilmenite, rutile and arsenopyrite.

Tetrahedrite (freibergite) was the only silver-bearing mineral identified, and was found only in the polished section prepared from the heavy liquid concentrate of the head sample. Electron micro-probe analysis showed it to contain a relatively high silver content of 15.4%, a copper content of 27.1% and an antimony content of 24.5%.

The liberation of the ore minerals was estimated by microscopic examination of the heavy-liquid fractions of the head sample. A rough assessment is that the ore minerals occur mostly as combined grains at -48+100 mesh but mostly as free grains at -100+200 mesh.

CONCLUSIONS

The samples examined indicate a complex base metal ore, with sphalerite, galena and chalcopyrite as the principle sources of base metals. The other metal that would probably add to the value of the ore is the silver in the tetrahedrite.

The mineralogical examination did not reveal any factors that are likely to have a serious adverse affect on the beneficiation of the ore.

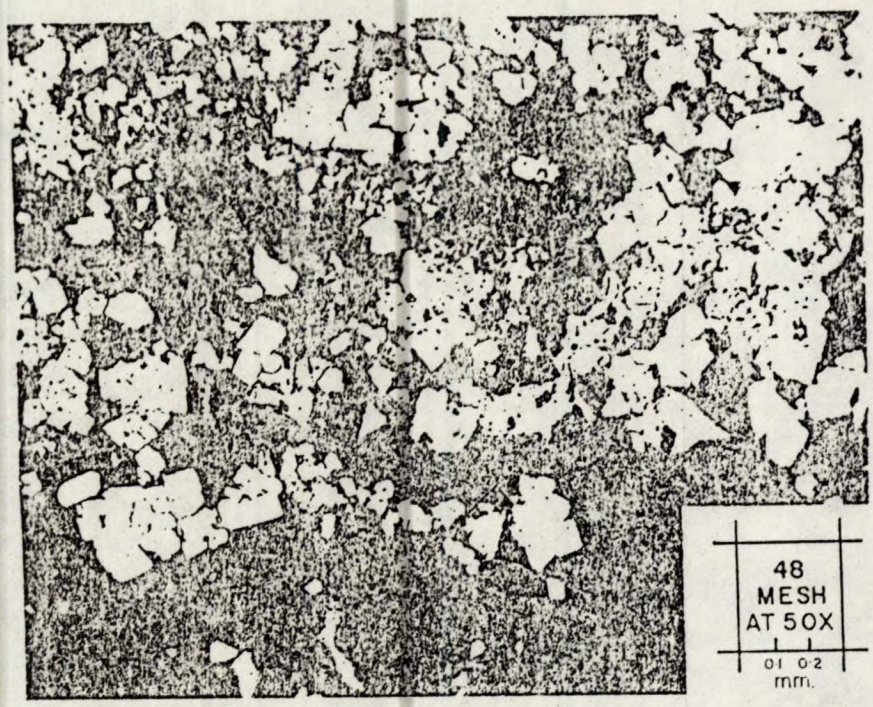

Figure 1. Sphalerite matrix (dark grey) with inclusions of pyrite (white) and chalcopyrite (light grey). The black areas are gangue and polishing pits.

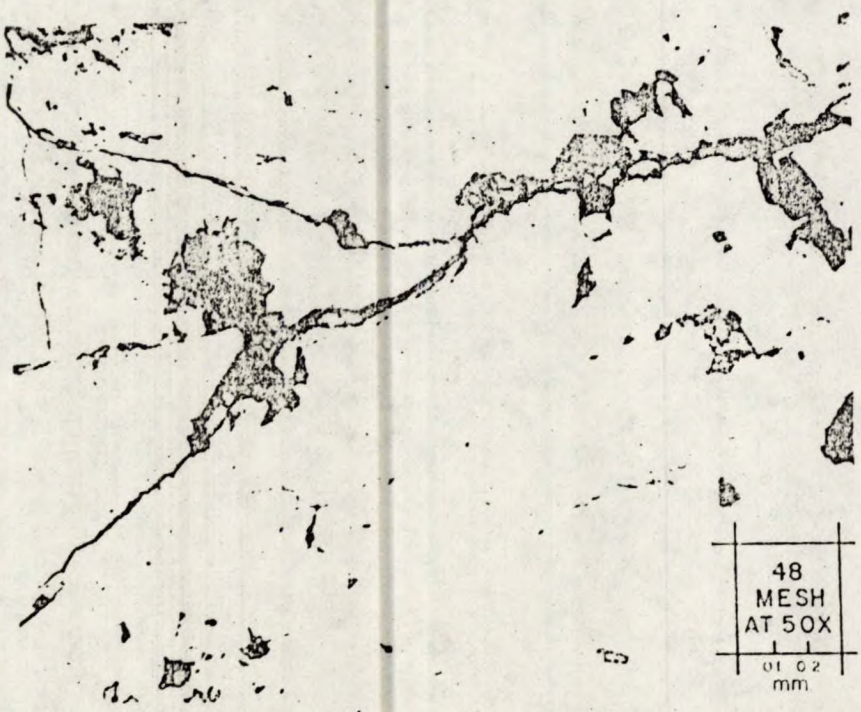

Figure 2. Massive pyrite (white) with veins consisting of gangue (dark grey) and sphalerite (light grey). The black areas are polishing pits.

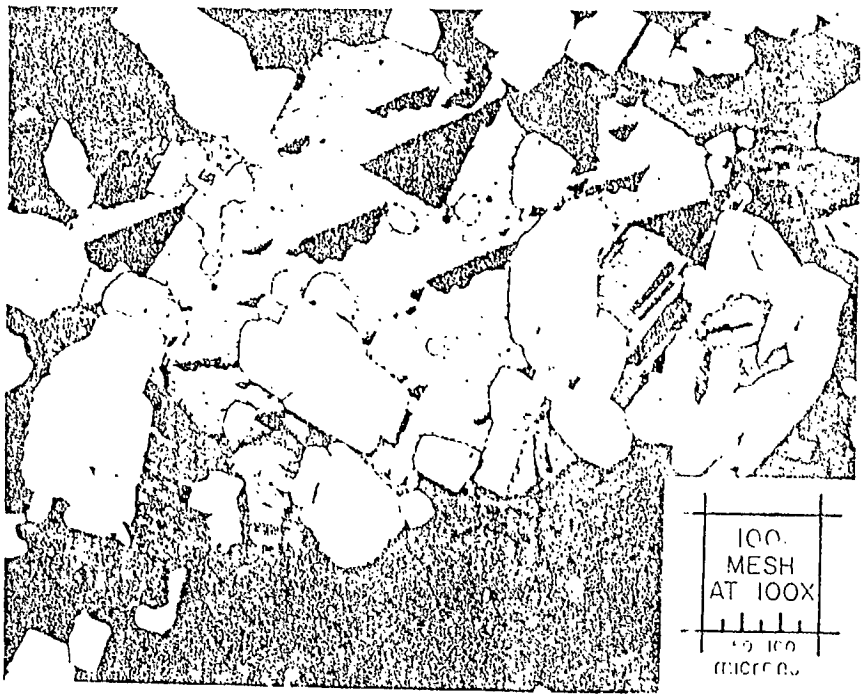

Figure 3. Galena (light grey) with inclusions of pyrite (white) in gangue (dark grey); the black triangular areas are polishing pits.

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