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A MINERALOGICAL INVESTIGATION OF THE ORE FROM MOUNT PLEASANT MINES LIMITED, NEW BRUNSWICK

by

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MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

The samples from Mount Pleasant Mines Limited, Mount Pleasant, New Brunswick, consist largely of quartz, fluorite and a variety of metallic minerals. The significant metallic minerals are cassiterite, stannite and sphalerite. The cassiterite occurs as isolated grains in metallic and non-metallic minerals, and stannite and sphalerite occur as masses and irregular grains. The sphalerite contains numerous tiny inclusions of either chalcopyrite or pyrrhotite.

Other minerals in the samples are arsenopyrite, pyrite, wolframite, marcasite, molybdenite, galena, glaucodot, rutile, a clay mineral, feldspar, topaz, zircon, calcite, scorodite, arsenobismite, and malachite.

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INTRODUCTION

Three samples of zinc-tin ore from Mount Pleasant Mines Limited in New Brunswick were received from G.O. Hayslip of the Mineral Processing Division. Sample A was a composite sample from diamond drill hole Numbers 16, 56, 60, and 61; Sample B was a sample from diamond drill hole No. 45; and Sample C was a sample of bulk Sample No. 3. As received, each sample consisted of several hand specimens as well as a head sample ground to approximately -10 mesh.

METHODS OF INVESTIGATION

The sections prepared from the hand specimens are as follows; one thin section and eight polished sections from Sample A; one thin section and three polished sections from Sample B; and four polished sections from Sample C.

The crushed head samples were screened and the -100+150 mesh portions were separated by means of heavy liquids. The resulting fractions were weighed and the minerals identified. The approximate percentages of the minerals in each portion were estimated from X-ray diffractometer data and the approximate mineral contents of the -100+150 mesh portions of the head samples were calculated.

RESULTS OF INVESTIGATION

The metallic minerals present in the samples from Mount Pleasant Mines Limited are sphalerite, stannite, chalcopyrite, galena, arsenopyrite, pyrite, pyrrhotite, marcasite, cassiterite, wolframite, rutile, molybdenite and glaucodot. The non-metallic minerals are quartz, feldspar, a clay mineral, chlorite, fluorite, topaz, and traces of calcite, zircon, malachite, arseno-bismite and scorodite ($FeAsO_4.2H_2O$).

The approximate mineral contents of the -100+150 mesh portions of head samples A, B and C were determined by the method noted in the preceding section and the results are listed in Table 1.

TABLE 1

Mineral Contents of the -100+150 Mesh Portions Prepared from Ground Head Samples A, B and C

Mineral	Fraction from Sample A	Fraction from Sample B	Fraction from Sample C
Quartz	67%	85%	80%
Clay Mineral	11	4	5
Fluorite	11	4	5
Topaz	1	3	tr
Zircon	--	--	tr
Feldspar	tr	1.4	tr
Calcite	0.5	--	tr
Sphalerite and Stannite	4.5	0.1	5.3
Cassiterite	0.5	0.9	1.3
Arsenopyrite	2.0	0.7	0.7
Pyrite	1.2	0.5	tr
Pyrrhotite	tr	tr	tr
Marcasite	tr	--	--
Chalcopyrite and Galena	0.5	tr	--
Wolframite	0.3	0.4	tr
Molybdenite	tr	tr	tr
Glaucodot	--	--	tr
Rutile	--	--	tr
Arseno-bismite and Scorodite	--	--	tr
Malachite	--	--	tr

Mineralogy and Textural Relationship of the Metallic Minerals in Sample A

Polished sections of Sample A show that the metallic minerals occur as masses and as disseminated grains in the gangue. They are sphalerite, stannite, chalcopyrite, arsenopyrite, pyrite, and small amounts of cassiterite, galena, wolframite, pyrrhotite, marcasite and molybdenite (see Figures 1 and 2).

Sphalerite, the principal metallic mineral in Sample A, occurs as masses and as small inclusions in stannite (see Figures 1 and 2). It contains inclusions of nearly all the metallic minerals present in the sample as well as small globules and lamellae of chalcopyrite (see Figure 3). The chalcopyrite globules are about 1 micron in diameter and the lamellae range up to 5 microns in width.

Stannite, which is also comparatively abundant in Sample A, occurs as masses and as inclusions in sphalerite (see Figure 1). It contains inclusions of sphalerite, chalcopyrite, arsenopyrite and galena.

Arsenopyrite and pyrite occur as masses and as euhedral to subhedral grains in the sphalerite, stannite and gangue. The euhedral to subhedral grains range between 0.01 mm and 1.0 mm in diameter. Some of the arsenopyrite and pyrite grains in the sphalerite are intergrown with marcasite, and some of the pyrite grains in the gangue are intergrown with pyrrhotite.

The chalcopyrite occurs in sphalerite as tiny globules and lamellae and as larger irregular inclusions in both sphalerite and stannite. The larger inclusions range between 5 and 150 microns in diameter, as can be seen in Figure 1 and compared to the small globules in Figure 3.

The cassiterite is present as isolated irregular grains in sphalerite, stannite and gangue. The grains range between 20 microns and 300 microns in diameter (see Figure 2).

Galena was observed in sphalerite and stannite as irregular grains that range between 20 microns and 150 microns in diameter.

The wolframite was observed only in the gangue where it occurs as isolated irregular grains that range between 0.02 mm and 1.0 mm in diameter.

The pyrrhotite occurs as tiny globules in sphalerite and as small grains intergrown with pyrite.

Marcasite was observed only as inclusions in sphalerite, where it is intergrown with either pyrite or arsenopyrite.

No molybdenite was observed in the polished sections but a small amount is present in the -100+150 mesh portion of the head sample.

Mineralogy and Textural Relationship of the Metallic Minerals in Sample B

The metallic minerals in Sample B occur largely as disseminated grains in the gangue. They are arsenopyrite, pyrite, cassiterite, wolframite, sphalerite, and small amounts of chalcopyrite and molybdenite.

The textural relationships of cassiterite, wolframite, arsenopyrite and pyrite are similar to those in Sample A.

Sphalerite occurs as masses and as small irregular grains in gangue. All the sphalerite contains chalcopyrite globules and the massive sphalerite contains euhedral to subhedral grains of arsenopyrite and pyrite and irregular grains of sphalerite.

No molybdenite was observed in the polished sections but a small amount is present in the -100+150 mesh portion of the sample.

Mineralogy and Textural Relationship of Sample C

The metallic minerals in Sample C are sphalerite and small amounts of pyrite, arsenopyrite, cassiterite, rutile, pyrrhotite and glaucodot. The non-metallic minerals are quartz, feldspar, a clay mineral, malachite, arseno-bismite and scorodite ($FeAsO_4.2H_2O$). The malachite, arseno-bismite and scorodite occur as green films along fracture surfaces.

Sphalerite, the principal metallic mineral, occurs as clusters of euhedral to anhedral crystals. Some of the sphalerite

contains small rounded inclusions of pyrrhotite (see Figure 4), and irregular grains of cassiterite and rutile. The pyrrhotite inclusions range up to 5 microns in diameter, and the cassiterite and rutile grains range between 15 and 150 microns in diameter.

CONCLUSION

Mineralogical studies of the samples from Mount Pleasant Mines Limited show that the more significant metallic minerals are stannite, sphalerite, cassiterite, and possibly, chalcopyrite, galena, wolframite and molybdenite. The stannite occurs as masses and as irregular grains, and it is estimated that it would be largely liberated at a grind of around -325 mesh. The sphalerite also occurs as masses but it contains numerous tiny inclusions of chalcopyrite and pyrrhotite which cannot be liberated at practical grinds. The cassiterite, wolframite and galena would no doubt be largely freed at a grind of -325 mesh.

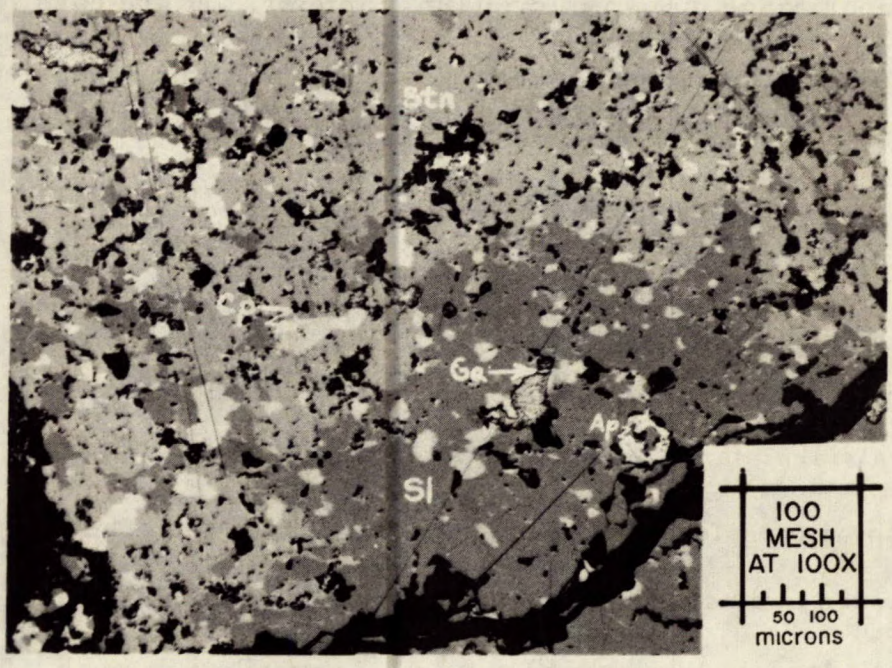

Figure 1 - Photomicrograph of a polished section of Sample A showing the massive stannite (Stn) and sphalerite (Sl). The whitish-grey areas in sphalerite and stannite are chalcopyrite (Cp), and arsenopyrite (Ap). The pitted white area marked Ga is galena.

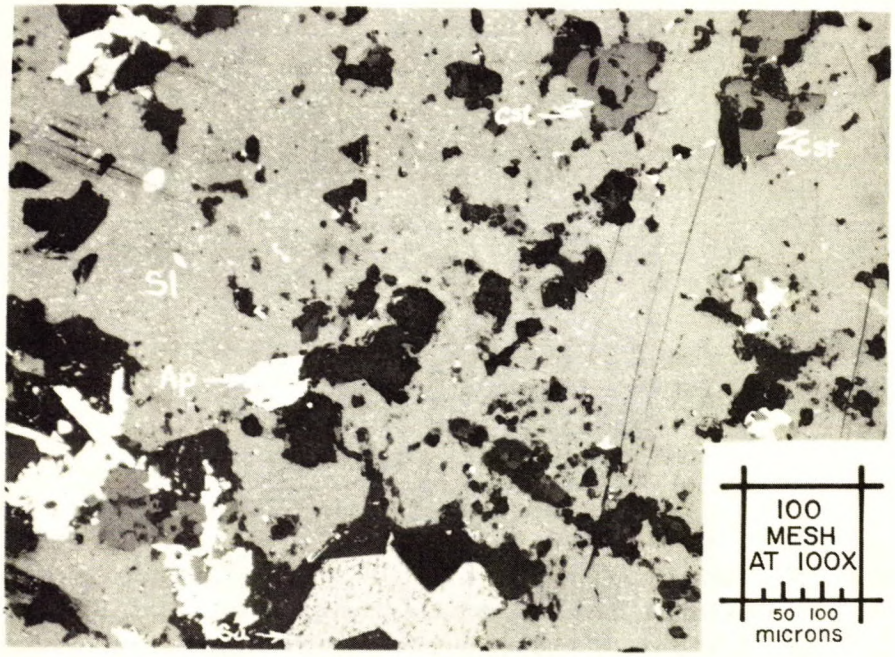

Figure 2 - Photomicrograph of a polished section from Sample A showing massive sphalerite (Sl) containing the numerous tiny inclusions of chalcopyrite (light grey dots). The dark grey areas marked Cst are cassiterite, and the white ones marked Ap are arsenopyrite or pyrite. The white pitted area marked Ga is galena.

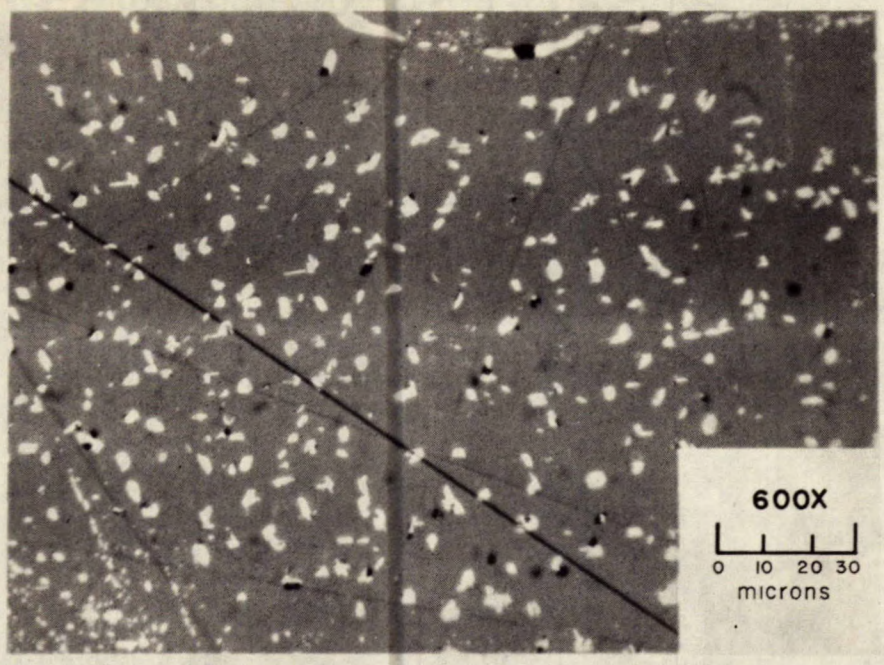

Figure 3 - Photomicrograph of a polished section from Sample A showing a field of sphalerite (grey) containing tiny inclusions of chalcopyrite (white dots).

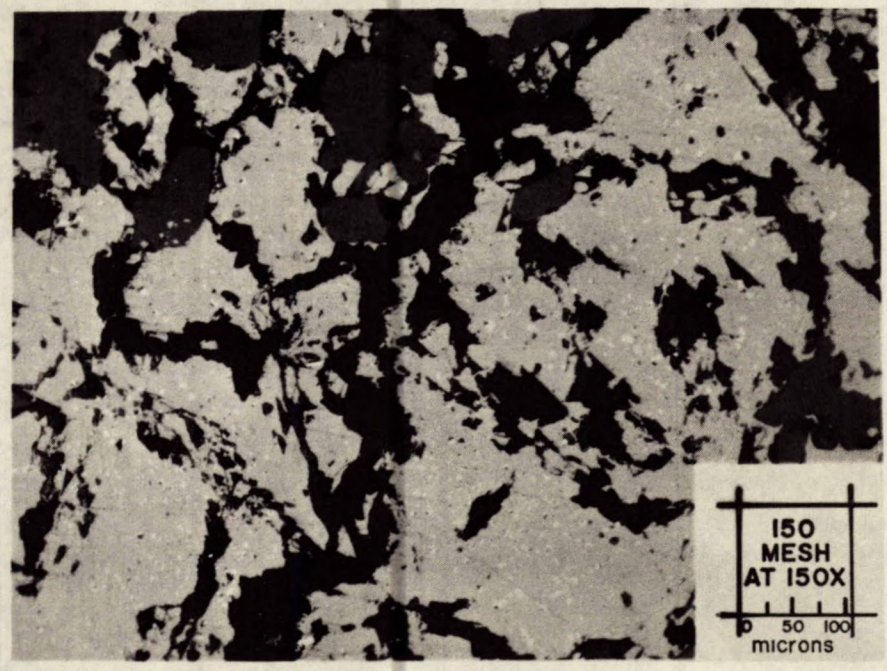

Figure 4 - Photomicrograph of a polished section from Sample C showing pyrrhotite inclusions (white dots) in sphalerite (grey). The dark grey areas are gangue and the black areas are pits on the polished surfaces.

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