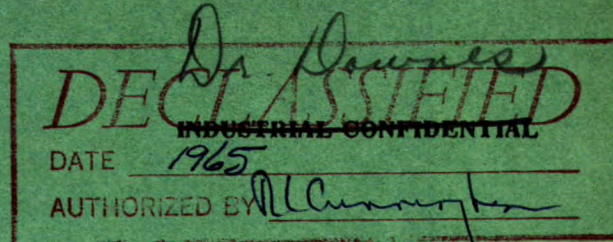


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OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 63-15

MINERALOGICAL INVESTIGATION OF SAMPLES FROM THE MOUNT PLEASANT TIN DEPOSIT IN NEW BRUNSWICK

by

W. PETRUK

MINERAL SCIENCES DIVISION

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- - -

SUMMARY OF RESULTS

The preliminary study of samples from Mount Pleasant Mines, Charlotte County, New Brunswick, indicates that the deposit is complex mineralogically, and more than twenty minerals have been found. Sphalerite is the principal metallic mineral. Although most of the tin occurs in the form of cassiterite some is also contained in the mineral stannite. Attempts to separate pure cassiterite in order to study its character proved impossible, and even in the -65 mesh and finer sizes, the mineral could be concentrated only to a limited degree. This is because the cassiterite grains, even in these fine sizes, are not freed from other metallic and non-metallic minerals. For this reason it may prove difficult to satisfactorily concentrate the tin.

Concentrates prepared in connection with beneficiation tests being conducted in the Mineral Processing Division also were studied.

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INTRODUCTION

The tin deposit in the Mount Pleasant area, Charlotte County, New Brunswick, has been under development by Mount Pleasant Mines Limited since early in 1961. During the course of development work, which included diamond drilling, driving an adit into the ore zone, experimental ore dressing, and preliminary mineralogical investigations, it became apparent that more information concerning the occurrence of the tin-bearing minerals was required, and in June, 1962, D.E.C. King, Research Manager of Mount Pleasant Mines Limited and G.O. Hayslip in the Mineral Processing Division of the Mines Branch, who is conducting mill tests on this ore, discussed the course of future mineralogical investigations with M.H. Haycock, Head of the Mineralogy Section, Mineral Sciences Division of the Mines Branch, and with the writer. As a result, detailed studies of the ore and mill products were undertaken and the feeling was that emphasis should be given to the study of the tin-bearing minerals and their associations. Samples for this purpose were furnished by Mr. King and Mr. Hayslip.

SAMPLES

Mr. King submitted one hand specimen of tin-bearing massive sulphides from a kaolinized zone plus twelve diamond drill core samples. Eleven of the core samples had been analysed. A list of the diamond drill core samples, their locations, and the results of the analyses are given in Table 1.

TABLE 1

Diamond Drill Core Samples Submitted by D.E.C. King

Diamond drill hole	Depth	Location of hole	Analysed Values*								Ag (oz/ton)	
			Cu Wt. %	Pb Wt. %	Zn Wt. %	Sn Wt. %	Mo Wt. %	W Wt. %	As Wt. %	Sb Wt. %		
83	160-165	1600 E										
87	148-155	1000 E	3.00	0.19	28.8	0.19	0.02	0.15	-	-	-	0.29
87	440-445	1000 E	0.64	0.05	1.2	0.10	0.03	0.22	1.50	0.59	-	0.35
90	50-55	1200 E	0.99	0.43	4.1	1.32	0.01	-	-	-	-	0.32
90	405-410	1200 E	3.39	2.52	43.5	2.97	0.01	0.29	1.74	1.02	-	0.68
94	90-100	600 E	0.95	0.36	3.9	0.28	0.01	0.10	0.52	0.62	-	0.26
100	195-200	900 E	0.90	0.07	3.8	0.06	0.004	0.17	0.95	0.79	-	0.29
100	205-215	900 E	1.28	0.12	13.0	0.10	0.02	-	-	-	-	0.38
100	270-275	900 E	1.06	5.13	3.0	0.11	0.02	0.63	3.54	0.95	-	0.41
101	158-162	700 E	1.28	0.51	1.6	0.16	0.01	0.21	0.26	0.33	-	0.14
102	93.5-95	100 E	0.53	0.23	3.2	0.25	0.08	0.71	0.37	1.04	-	0.46
102	95-97.5	100 E	1.15	0.66	1.2	0.13	0.01	0.70	0.74	1.36	-	0.22

* All analyses by Analab Limited, Ottawa, Canada and furnished by D.E.C. King of Mount Pleasant Mines Limited.

G.O. Hayslip submitted the following samples and mill products:

- (a) Head sample of Bulk Sample No. 4 crushed to about -10 mesh.
- (b) Sized fraction from Bulk Sample No. 4, the details of which are given in Table 2.
- (c) Magnetic cleaner concentrate from Test No. B-3-10.
- (d) Magnetic middling from Test No. B-3-10.
- (e) Non-magnetic tailing from Test No. B-3-10.
- (f) Zinc cleaner concentrate from Test No. B-3-14.
- (g) +100 mesh sand table concentrate from Test B-4-8.
- (h) -100+150 mesh sand table concentrate from Test B-4-8.
- (j) -150+200 mesh sand table concentrate from Test B-4-8.
- (k) -200 mesh sand table concentrate from Test B-4-8.

TABLE 2

Sized Fractions of Bulk Sample No. 4

<u>Screen sizes (Tyler)</u>	<u>Weight per cent</u>
-10+14	14.05
-14+20	18.40
-20+28	12.62
-28+35	10.34
-35+48	8.05
-48+65	6.61
-65+100	6.02
-100+150	5.61
-150+200	3.43
-200+325	2.61
-325	<u>12.26</u>
Total	100.00

PROCEDURE

Polished and thin sections were prepared from the samples submitted by Mr. King and polished sections were prepared from the head sample submitted by Mr. Hayslip. The minerals were identified and their textural relationships were studied.

The remaining samples received from Mr. Hayslip were split and one portion was analysed by means of the X-ray diffractometer. The other portion was separated into fractions by means of the Frantz isodynamic separator, the superpanner and liquids ranging from 2.7 to 4.3 in specific gravity. Oil immersion mounts from each fraction were examined under the petrographic microscope. Polished sections of those fractions containing significant amounts of metallic minerals were examined under the ore microscope.

The high grade zinc concentrate from Test No. B-3-14 (Sample (f)) was used to derive the composition of the sphalerite, which was calculated on the basis of chemical and microscopical data.

A cassiterite-rich fraction was analysed spectrochemically for the trace elements. This fraction was prepared from the -150+200 mesh sand table concentrate (Sample (j)) by treating the sample in a liquid with specific gravities of 4.3, followed by separation in the Frantz isodynamic separator. It was finally treated with dilute acid to remove any sulphides that might have remained. The mineralogical composition of this residue was determined by a combination of chemical analysis and X-ray diffractometer, microscopical and ultraviolet light studies in order to establish the identity of the impurities present in it.

A chlorite concentrate was prepared and studied by means of the X-ray diffractometer and the Frantz isodynamic separator in order to identify the variety.

RESULTS OF INVESTIGATION

General Mineralogy

Study of the hand specimen and diamond drill core samples submitted by Mr. King reveals that the ore consists of massive and disseminated metallic minerals in a quartz-rich gangue. The metallic minerals are black sphalerite, arsenopyrite, pyrite, marcasite, pyrrhotite, chalcopyrite, galena, stannite, cassiterite, goethite, covellite, molybdenite and chalcocite.

The non-metallic minerals are quartz, varying quantities of fluorite and chlorite, and small quantities of feldspar, topaz, rutile, calcite, and zircon. Minute amounts of scheelite were detected in certain samples.

Detailed Mineralogy

Sphalerite

A very dark (black) variety of sphalerite is the principal metallic mineral. It commonly occurs in massive forms, but an appreciable quantity occurs as irregular grains in the gangue. The sphalerite contains numerous inclusions, among which all the other minerals in the ore are represented (see Figure 1). Chalcopyrite is the most common inclusion and characteristically occurs as numerous small globules and lamellae (see Figure 2). Stannite and pyrrhotite occur in the same manner, but their quantities are comparatively small. The globules and lamellae range in size from sub-microscopic specks to individuals 20 microns in diameter (see Figure 3). They are generally distributed irregularly throughout the sphalerite, but in some cases distinct banding was observed (see Figure 4).

The black colour of the sphalerite indicates that it is very high in iron. Measurements on four samples give consistent values very close to 5.41 A for the cell edge, but when this value is referred to Kullerud's curve (2), an iron-lean variety is indicated. In order to resolve these apparently incompatible results, the zinc recleaner concentrate from Test No. B-3-14 (Sample (f)) was analysed chemically, with the results given in Table 3.

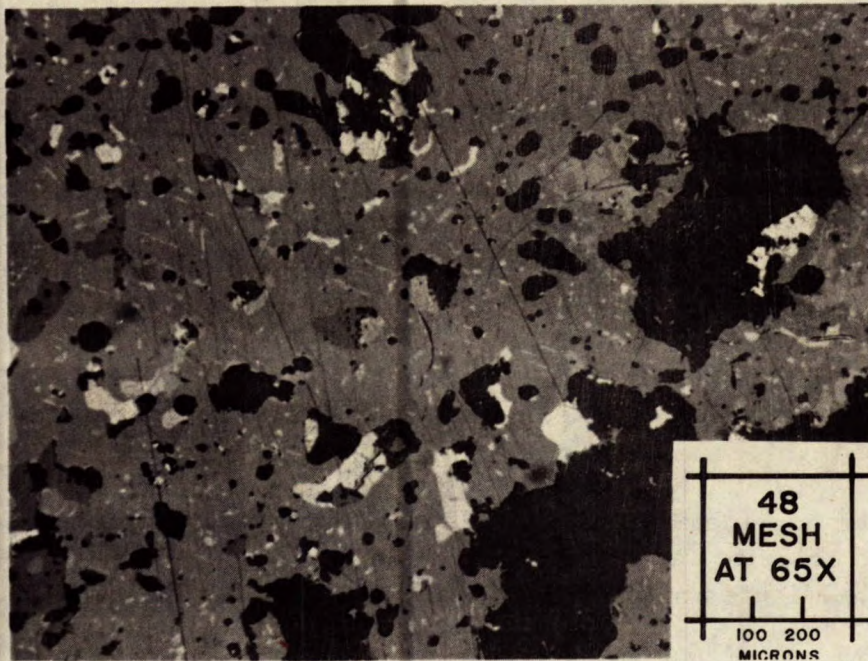


Figure 1. Photomicrograph of a polished section of massive sulphide showing cassiterite grains (dark grey) in sphalerite (medium grey). The irregular light grey areas and the light grey dots represent stannite. The irregular white areas represent chalcopyrite, pyrite and arsenopyrite, and black areas represent gangue inclusions or pits.

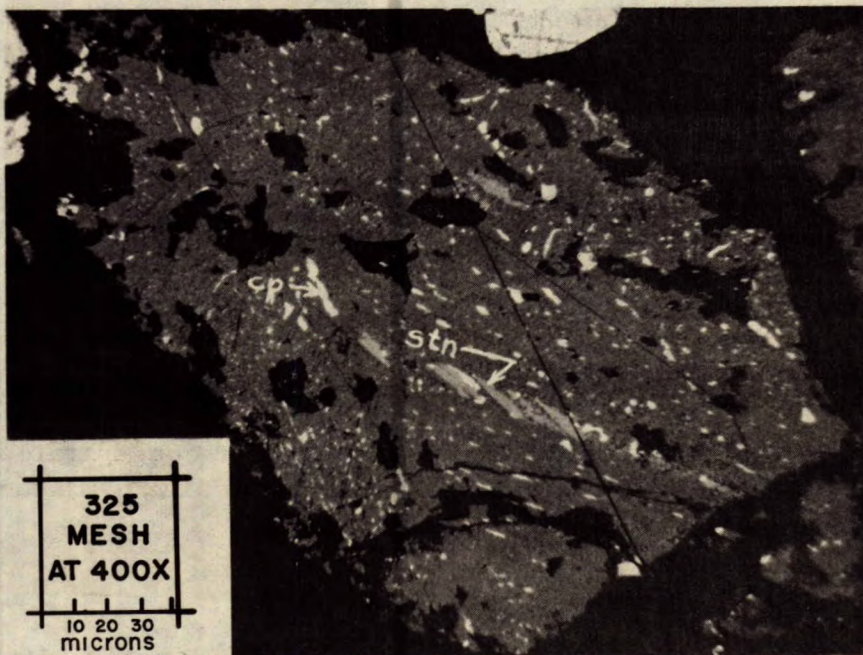


Figure 2. Photomicrograph of a polished section of a sphalerite grain that contains chalcopyrite (Cp) and stannite (Stn) inclusions.

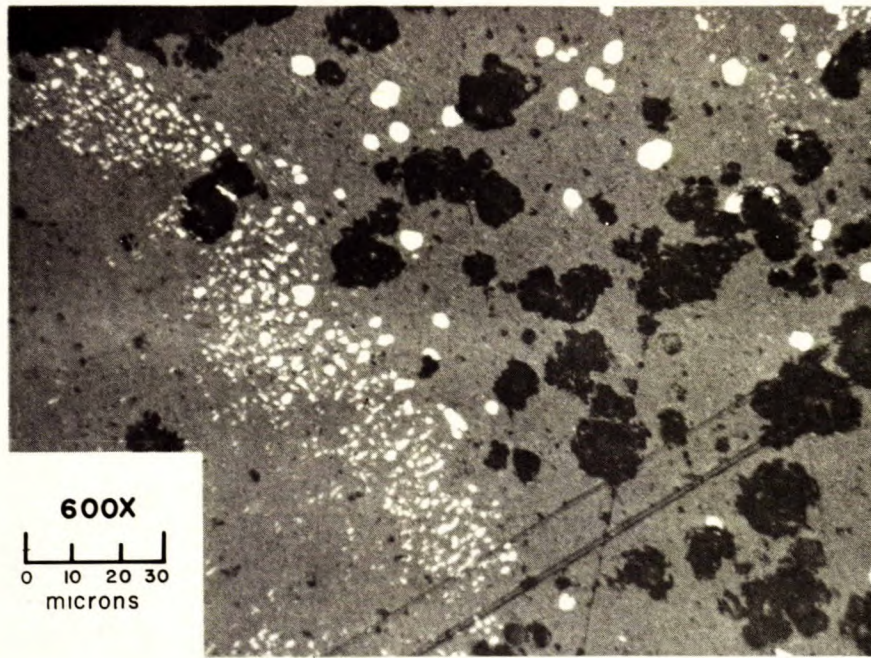


Figure 3. Photomicrograph of a polished section of sphalerite (grey) showing different sizes of chalcopyrite globules (white).

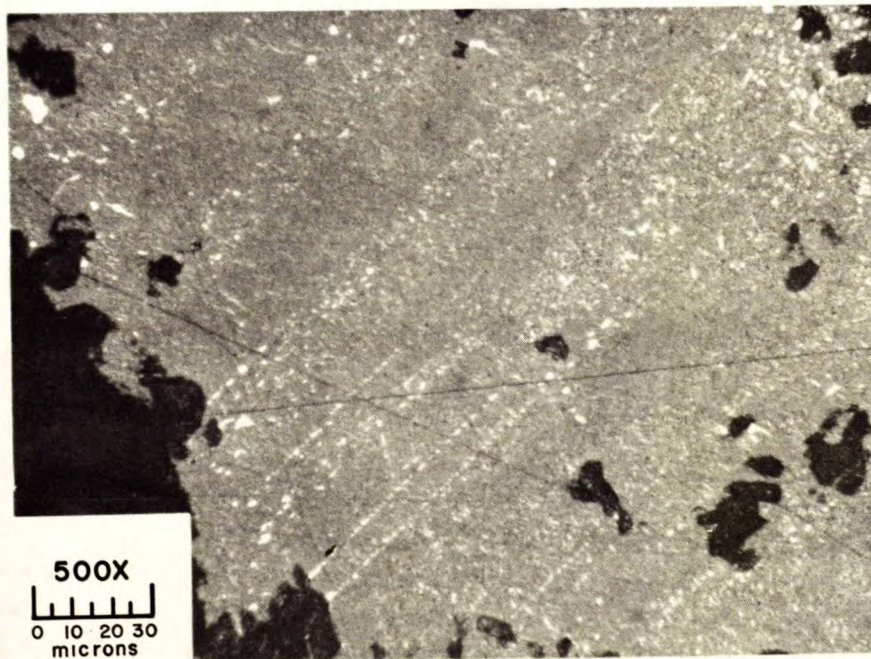


Figure 4. Photomicrograph of a polished section of sphalerite showing an apparent banding produced by chalcopyrite globules (white). The black areas are pits.

TABLE 3

Chemical Analysis of Zinc Recl. Conc. Test No. 14*

<u>Element</u>	<u>Weight per cent</u>
Zn	45.02
Fe	13.12
S	30.70
Cu	2.07
Sn	0.14
Insol.	<u>4.35</u>
Total	95.40**

* Analysis by A.F. Piche, R.W. Buckmaster, H.H. Bart;
Internal Report MS-AC-62-949, Analytical Chemistry
Subdivision, Mineral Sciences Division, Mines Branch.

** Microscopical studies of the sample suggest that chlorite
and fluorite account for the remaining 4.60%.

On the basis of microscopical and X-ray data, the chemical analysis was then adjusted to allow for other minerals in the sample and the composition of sphalerite was calculated. The calculations, the results of which are shown in Table 4, were made in the following manner:

- (a) All of the Sn was calculated as stannite ($\text{Cu}_2\text{FeSnS}_4$)
(see Column 3).
- (b) The remaining Cu was calculated as chalcopyrite (CuFeS_2)
(see Column 4).
- (c) Microscopical and X-ray diffractometer analysis indicated that approximately 1% pyrite is present so the appropriate amounts of Fe and S were allotted to pyrite (see Column 5).
- (d) All of the Zn was calculated as sphalerite, and the remaining S was calculated as combined with Fe to form the FeS present in sphalerite (see Column 6).
- (e) The theoretical composition of the sphalerite was then calculated by making the total of Zn + Fe + S in sphalerite equal to 100% (see Column 7).

The globules and lamellae of chalcopyrite and stannite are so small that they must be expected to concentrate along with the sphalerite. The theoretical composition of the sphalerite plus these components was therefore calculated on the assumptions that all of the stannite and 3% of the chalcopyrite in this sample occur in these forms. These assumptions were made on the basis of careful microscopical observations. The results are given in Column 8.

TABLE 4

Results of Calculations to Determine the Composition of Sphalerite

Column 1 Element	Column 2 Chemical analysis Wt. %	Column 3 Wt. % in stannite	Column 4 Wt. % in chalco- pyrite	Column 5 Wt. % in pyrite	Column 6 Wt. % in sphalerite	Column 7 Composition of sphalerite (adjusted to 100%)	Column 8 Composition of sphalerite plus lamellae and globules
Zn	45.02				45.02	54.88	52.63
Sn	0.14	0.14					0.16
Cu	2.07	0.15	1.92				1.37
Fe	13.12	0.07	1.75	0.47	8.95	10.91	11.63
S	30.70	0.15	1.95	0.53	28.07	34.21	34.21
Insol.	<u>4.35</u>	—	—	—	—	—	—
Total	95.40	0.51	5.62	1.00	82.04	100.00	100.00

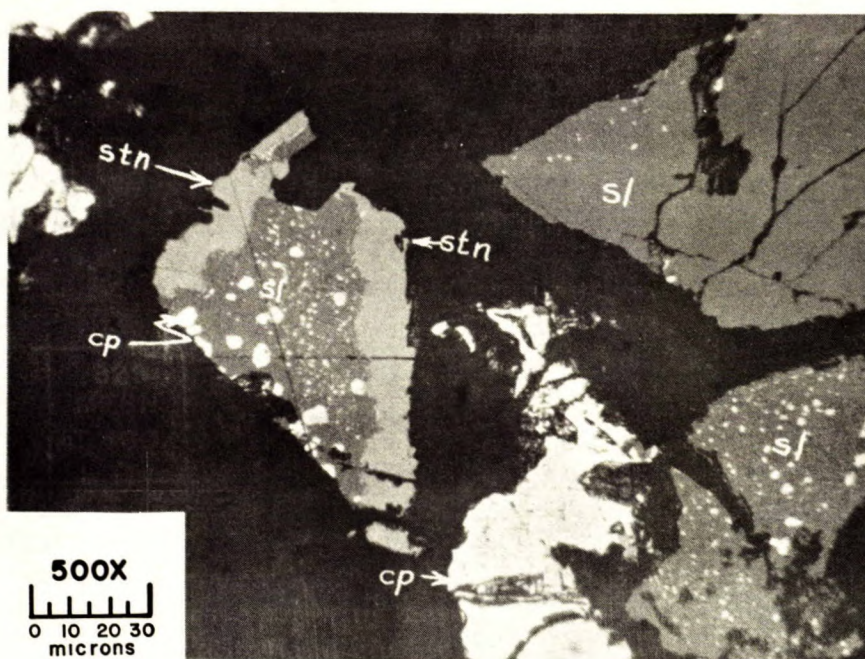


Figure 5. Photomicrograph of a polished section of a zinc-copper-tin concentrate showing relations of the sphalerite (Sl), stannite (Stn) and chalcopyrite (Cp).



Figure 6. Photomicrograph of a polished section of a zinc-copper-tin concentrate showing relations of sphalerite (Sl), stannite (Stn) and chalcopyrite (Cp).

Cassiterite

The cassiterite is light brown and has an adamantine luster. Its magnetic susceptibility, as determined by means of the Frantz isodynamic separator, varies between 0.1 and 3.5×10^{-6} e.m.u. The cassiterite crystals range from 10 to 300 microns in diameter, but they rarely can be seen in hand specimens. Thin and polished sections show that the cassiterite crystals occur in fluorite, kaolinite, sphalerite, chlorite, quartz and rutile. Those in fluorite, kaolinite and quartz tend to exhibit euhedral forms (see Figures 7 and 8), whereas those that occur in sphalerite, chlorite and rutile tend to be anhedral and are intergrown with these minerals (see Figures 9 and 10). This intergrowth is complex and a number of the grains present in Sn concentrates submitted by Mr. Hayslip contain minute cassiterite crystals intergrown with, and occasionally surrounded by, these minerals. The magnetic susceptibility of grains consisting of small cassiterite crystals intergrown with chlorite ranges from 3.5 to 35×10^{-6} e.m.u.

The trace elements present in a fraction containing 86.5% cassiterite, 4.7% zircon, 3.3% quartz, 0.7% rutile, 0.7% chlorite and about 1% scheelite were determined spectrochemically. The results are given in Table 5.

TABLE 5

Trace Elements Present in a Cassiterite-Rich Fraction
(as determined by spectrochemical analysis)*

<u>Element</u>	<u>Weight per cent</u>
Ni	0.1
Ga	0.03
Cu	0.01
V	0.01
In	0.008
Mn	0.005
Ag	0.004
Be	0.0004

* Spectrographic Laboratory Report, Internal Report
MS-AC-62-231 by E.M. Kranck.

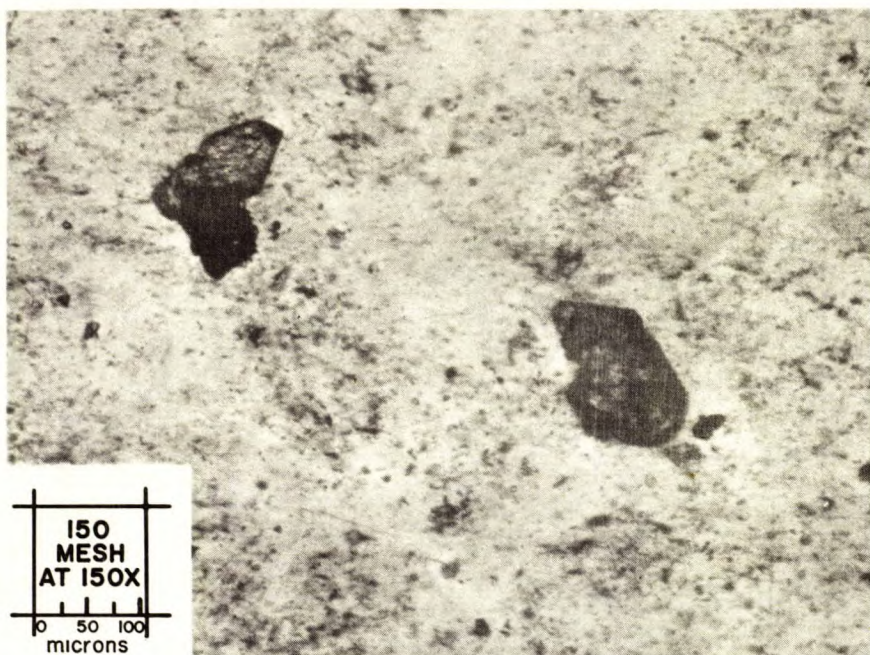


Figure 7. Photomicrograph of a thin section of a sample of drill core from Hole No. 102 at a depth of 93.5-95 feet. The photograph shows euhedral cassiterite grains (dark grey) in a quartz matrix.

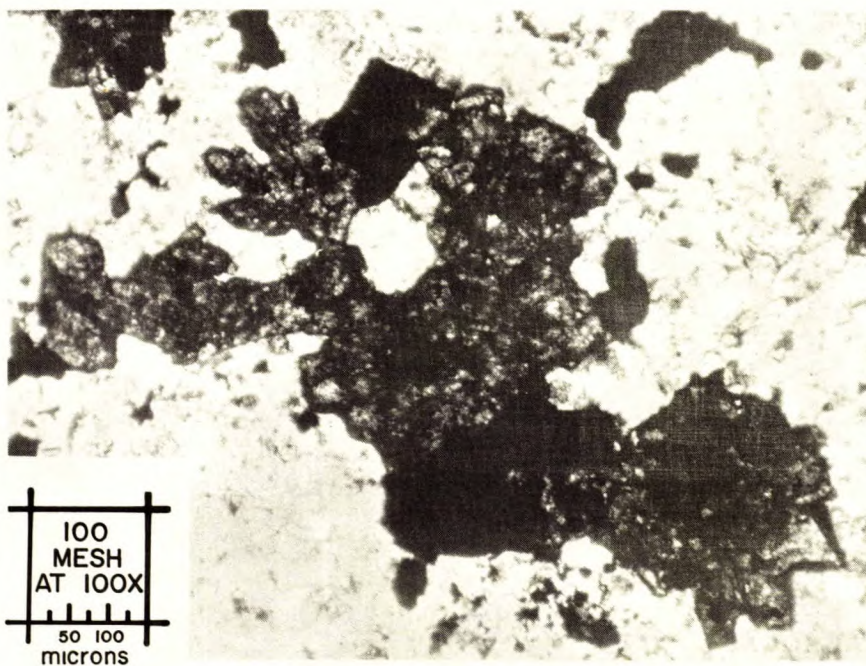


Figure 8. Photomicrograph of a thin section of a sample of drill core from Hole No. 83 at a depth of 160 to 165 feet. The photograph shows cassiterite grains (mottled dark grey) in fluorite (white). The black areas represent sulphide minerals.



Figure 9. Photomicrograph of a thin section of a sample of drill core from Hole No. 100 at a depth of 270 to 275 feet. The photograph shows cassiterite grains (cas) intergrown with chlorite (chl). The mottled white matrix represents a quartz-chlorite mixture and the black areas represent sulphide minerals.

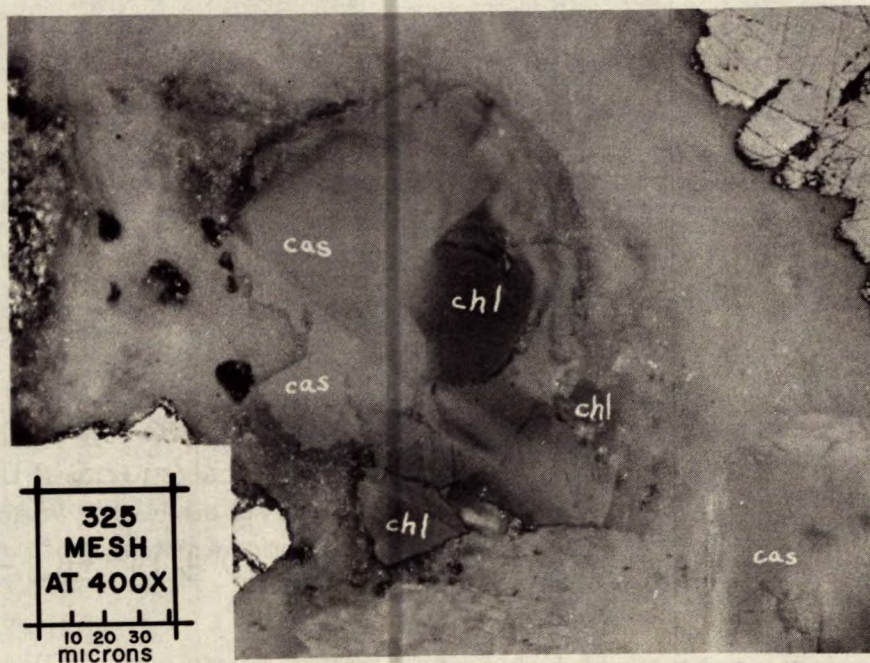


Figure 10. Photomicrograph of a polished section in oil immersion showing a cassiterite grain (cas) intergrown with chlorite (chl). The light grey background is mounting medium.

Stannite

Stannite is a black mineral that cannot be distinguished from sphalerite in hand specimens. Its appearance in polished sections is quite characteristic and under the microscope it is clear that only small amounts of this mineral are present in the ore. Moreover, stannite was found only in samples containing significant amounts of sphalerite. It occurs as irregular grains, as veinlets and as globules and lamellae in sphalerite. The irregular grains range from several millimetres to as little as 20 microns in diameter; the larger grains contain minute inclusions of chalcopyrite. The veinlets range up to 50 microns in width.

Chalcopyrite

Small amounts of chalcopyrite are present in all samples studied, but the mineral can rarely be seen in hand specimens. Under the microscope it is seen to occur as irregular inclusions and veinlets in sphalerite, arsenopyrite, and pyrite, and as the globules and lamellae noted in the description of sphalerite. The inclusions range from 20 to 150 microns in diameter.

Covellite and Chalcocite

Trace amounts of covellite occur along the edges of a few chalcopyrite and stannite grains in the massive sulphides. Very rare minute grains of a mineral thought to be chalcocite were observed in several of the larger stannite grains.

Galena

The galena occurs as irregular inclusions and small masses in massive sulphides and gangue. The inclusions range between 0.02 mm and 2.0 mm in diameter. The mineral is frequently intergrown with arsenopyrite and rarely with a grey, weakly anisotropic mineral that is tentatively identified as wittichenite (Cu_3BiS_3).

The cell edge of the galena was determined as 5.925 Å. This value is only slightly lower than normal (5.936 Å) and indicates very low silver (or bismuth) content in the galena. No correlation between the amount of Pb and Ag is apparent from the reported analyses of the drill core samples, and whether or not appreciable silver values are contained in the galena is not known.

Molybdenite

Individual grains of molybdenite were found in most of the polished sections of drill cores that were studied. These grains are very small and range up to 10 microns in diameter. They are invariably disseminated in the gangue.

Arsenopyrite and Pyrite

Arsenopyrite and pyrite occur as masses and euhedral to subhedral grains in the massive sulphides and gangue. The grains range between 0.01 mm and 1.0 mm in diameter. The minerals frequently are intergrown with each other and occasionally with marcasite. This co-existence of arsenopyrite and pyrite indicates that the minerals were deposited at temperatures below 491°C (1).

A measurement of d_{131} for arsenopyrite gives a value of 1.629A. This value falls below the range investigated by L.A. Clark (1) in his experimental studies on depositional temperatures of synthetic arsenopyrite. The lowest point on his chart is 1.632A, which is the d_{131} measurement for arsenopyrite deposited at 400°C. This suggests that the arsenopyrite at Mount Pleasant Mines may have been deposited at temperatures below 400°C. On the other hand, this low value for the cell edge may be due to the presence of trace elements such as cobalt and nickel in the arsenopyrite.

Marcasite

Marcasite was observed only as rare irregular grains intergrown with pyrite and arsenopyrite.

Pyrrhotite

Pyrrhotite was found only as tiny globules and lamellae in sphalerite. The quantity is exceedingly small.

Chlorite

Since chlorite is intimately associated with cassiterite, its properties and mode of occurrence were studied in some detail. The chlorite is light green in colour. It occurs as irregular grains and masses that sometimes contain one or more of the metallic minerals. Its magnetic susceptibility is about 75×10^{-6} e.m.u., indicating that it is an iron-rich variety. However, X-ray diffractometer studies show that it is not a normal chlorite, but one that has a mixed layer kaolinite-chlorite structure. This is similar to a variety of chlorite found in the Cornish tin deposits.

in England and this fact may eventually have some significance in interpreting the origin of the Mount Pleasant deposit.

LIBERATION SIZE OF CASSITERITE

Tests designed to ascertain the degree of liberation to be expected for the cassiterite were performed on the sized samples of Test No. 4(Sample (b)) submitted by Mr. Hayslip. These samples were separated into fractions by means of heavy liquids with specific gravities of 2.9 and 3.4, and the fractions were analysed chemically for Sn. The results, given in Table 6, indicate that in -65 mesh and finer fractions, 80% of the cassiterite is liberated sufficiently to be concentrated. However, high power oil immersion examination of these fractions show that many of the cassiterite grains have really not been freed from the metallic and non-metallic minerals (see Figures 11 to 15 inclusive), and that while they may be concentrated to a degree, it may be difficult to produce a high grade Sn concentrate and still effect good recovery.

The hand specimen of massive sulphide submitted by Mr. King was crushed, sized and passed through a heavy liquid with a specific gravity of 4.30. The resulting fractions were analysed chemically for acid soluble and total Sn. The results, given in Table 7, do not show any trend in liberation characteristics with respect to grain size. It is noted, however, that up to 25% of the tin in the sample is soluble and, hence, is regarded as occurring as stannite while the insoluble cassiterite accounts for the remainder.

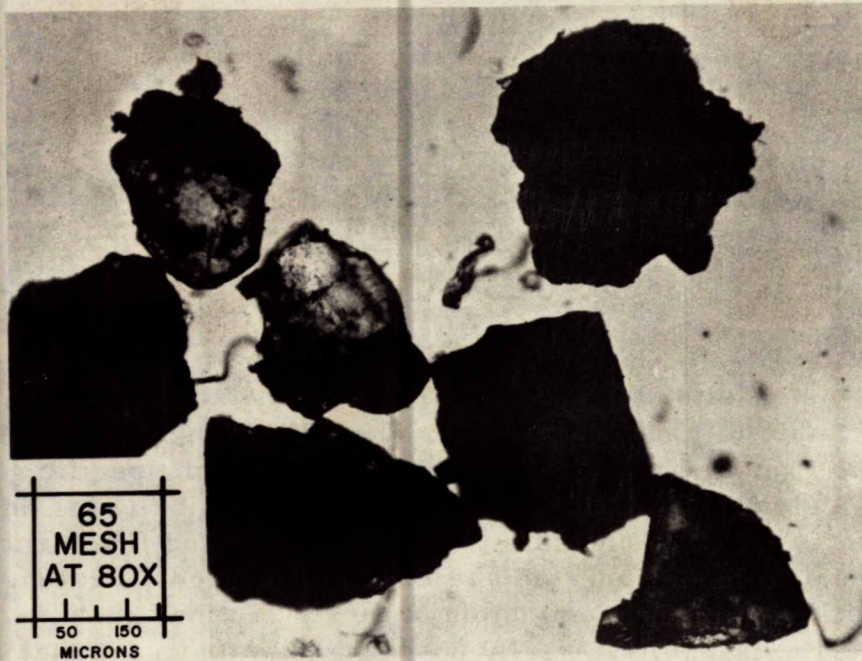


Figure 11. Photomicrograph of an oil immersion mount of a -48+54 mesh, 3.4 sink fraction. The colourless grains are cassiterite, the dark grey ones are chlorite and the black ones are sulphide minerals.

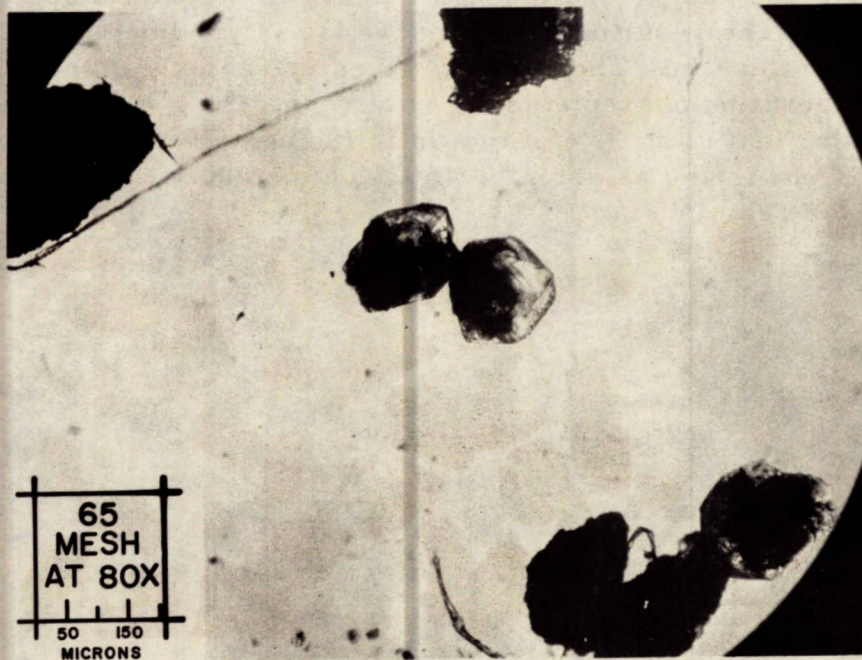


Figure 12. Photomicrograph of an oil immersion mount of a -65+100 mesh, 3.4 sink fraction. The colourless grains are cassiterite, the dark grey ones are chlorite, and the black ones are sulphide minerals.

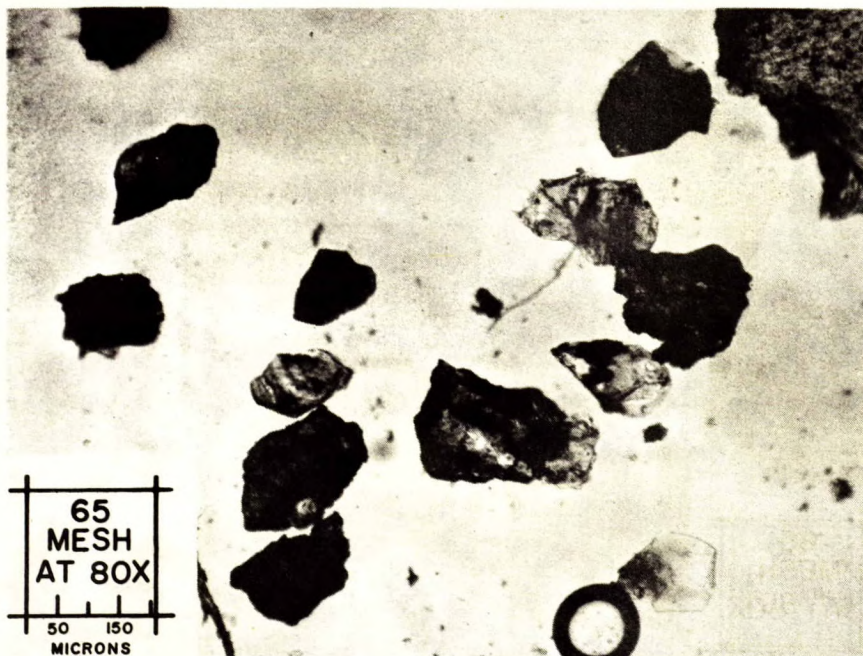


Figure 13. Photomicrograph of an oil immersion mount of a -100+150 mesh, 3.4 sink fraction. The colourless grains are cassiterite, the grey ones are chlorite and the black ones are sulphide minerals.



Figure 14. Photomicrograph of an oil immersion mount of a -150+200 mesh, 3.4 sink fraction. The colourless grains are cassiterite, the grey ones are chlorite and the black ones are a sulphide mineral.

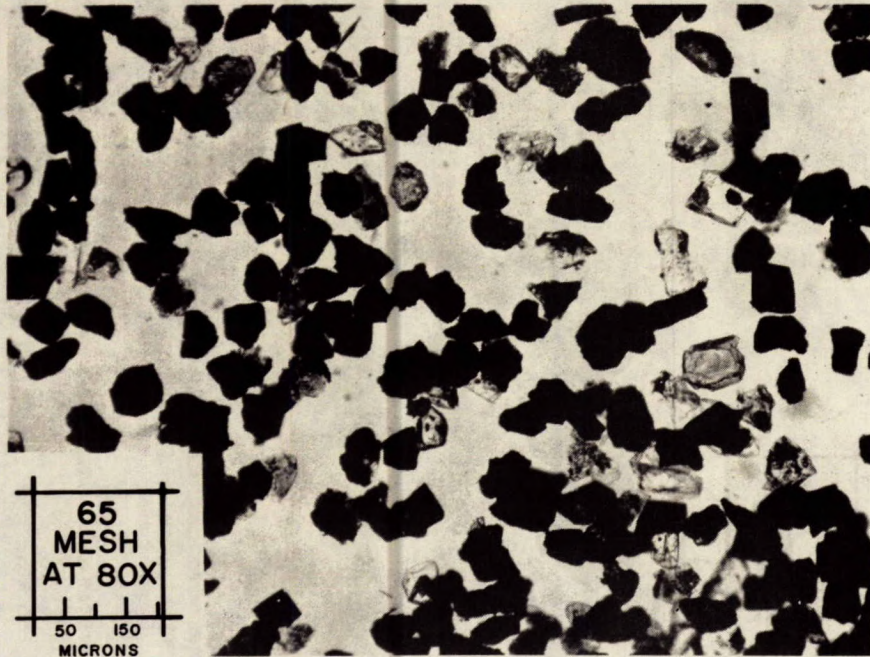


Figure 15. Photomicrograph of an oil immersion mount of a -200+325 mesh, 3.4 sink fraction. The colourless grains are cassiterite, the grey ones are chlorite and the black ones are sulphide minerals.

TABLE 6*

Tests to Determine Liberation Size of Cassiterite in Bulk Sample No. 4**

Column 1	Column 2	Column 3	Column 4	Column 5
Fraction of Sample	Weight per cent	Per cent Sn**	Distribution of Sn in Sample (Wt. %)	Distribution of Sn in each sized fraction (Wt. %)
-10+14 mesh				
Fl at 2.9	7.24	0.08	1.0	9.5
Fl at 3.4	6.24	0.30	3.3	30.9
S at 3.4	0.58	6.28	6.2	59.6
-14+20 mesh				
Fl at 2.9	8.56	0.09	1.4	8.3
Fl at 3.4	8.94	0.27	4.1	26.3
S at 3.4	1.00	5.99	10.4	65.4
-20+28 mesh				
Fl at 2.9	6.06	0.07	0.7	6.7
Fl at 3.4	5.75	0.28	2.8	25.4
S at 3.4	0.71	5.99	7.4	67.9
-28+35 mesh				
Fl at 2.9	4.84	0.07	0.5	6.3
Fl at 3.4	4.92	0.33	2.8	30.5
S at 3.4	0.59	5.71	5.9	63.2
-35+48 mesh				
Fl at 2.9	2.99	0.08	0.3	5.6
Fl at 3.4	4.46	0.23	1.7	24.1
S at 3.4	0.61	4.89	5.2	70.3
-48+65 mesh				
Fl at 2.9	3.10	0.07	0.3	5.3
Fl at 3.4	2.99	0.24	1.2	17.4
S at 3.4	0.65	4.89	5.5	77.3
-65+100 mesh				
Fl at 2.9	2.67	0.06	0.3	4.3
Fl at 3.4	2.73	0.21	1.0	15.2
S at 3.4	0.60	5.06	5.2	80.5
-100+150 mesh				
Fl at 2.9	2.73	0.06	0.3	3.8
Fl at 3.4	2.34	0.16	0.7	8.6
S at 3.4	0.65	5.90	6.6	87.6
-150+200 mesh				
Fl at 2.9	1.53	0.08	0.2	4.5
Fl at 3.4	1.59	0.08	0.2	4.7
S at 3.4	0.25	9.90	4.3	90.8
-200+325 mesh				
Fl at 2.9	1.14	0.07	0.2	3.6
Fl at 3.4	1.20	0.12	0.2	6.8
S at 3.4	0.22	8.55	3.3	89.6
-325 mesh	12.12	0.80	16.8	
Total	100.00		100.00	

Sample No. 4 contains 0.58% Sn.

* Columns 1, 2, 3 and 4 of Table 6 prepared by G.O. Hayslip of the Mineral Processing Division.

** Analysis by R.C. McAdam, Analytical Chemistry Subdivision, Mineral Sciences Division, Mines Branch.

TABLE 7

Tests to Determine Liberation Size of Cassiterite in Massive Sulphide

Fraction	Wt. %	Total Sn Wt. %*	Wt. %*	Soluble Sn (stannite)		Non-soluble Sn (cassiterite)			Wt. % Sn in stannite in sized fractions	Wt. % Sn in cassiterite in sized fractions
				Distribution of Sn in stannite		Wt. %	Distribution of Sn in cassiterite			
				in sized fractions Wt. %	in sample Wt. %		in sized fractions Wt. %	in sample Wt. %		
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11
-10+20 mesh Fl at 4.3 S at 4.3	5.0 16.1	7.38 18.24	2.52 0.84	90.5 9.4	6.9 7.4	4.86 17.40	47.2 52.8	2.7 30.8	21.2	78.8
-20+28 mesh Fl at 4.3 S at 4.3	8.6 10.7	5.10 14.74	2.21 1.63	52.5 47.5	10.4 9.5	2.89 13.11	15.0 85.0	2.7 15.4	18.0	82.0
-28+35 mesh Fl at 4.3 S at 4.3	5.9 7.6	4.70 14.52	2.14 2.14	44.0 56.0	6.9 8.9	2.56 12.38	13.9 86.1	1.7 10.3	18.7	81.3
-35+48 mesh Fl at 4.3 S at 4.3	5.0 4.4	4.59 15.44	2.23 1.71	59.5 40.5	6.1 4.1	2.36 13.73	16.1 83.9	1.3 6.7	20.5	79.5
-48+65 mesh Fl at 4.3 S at 4.3	4.1 3.3	4.56 16.00	2.14 1.54	63.0 37.0	4.8 2.8	2.42 14.46	17.0 83.0	1.1 5.3	19.0	81.0
-65+100 mesh Fl at 4.3 S at 4.3	4.7 3.4	4.40 15.44	2.37 1.23	72.0 28.0	6.1 2.3	2.03 14.21	16.3 83.7	1.0 5.3	20.8	79.2
-100+150 mesh Fl at 4.3 S at 4.3	2.8 1.8	5.13 16.05	2.38 1.23	70.0 30.0	3.6 1.2	2.75 14.82	23.6 76.4	0.8 2.9	22.5	77.5
-150+200 mesh Fl at 4.3 S at 4.3	3.1 1.5	5.53 16.44	2.64 1.03	85.0 15.0	4.5 0.8	2.89 15.41	28.8 71.2	1.0 2.5	23.7	76.3
-200+325 mesh Fl at 4.3 S at 4.3	2.6 1.5	5.51 15.52	2.76 1.11	82.0 18.0	3.9 0.9	2.75 14.41	25.2 74.8	0.8 2.4	23.8	76.2
-325 mesh	7.9	8.10	2.04		8.8	6.06		5.3	25.2	74.8
Total	100.0				100.0			100.0		

Sample contains 10.93% Sn.

* Analyses by R.C. McAdam, Internal Reports MS-AC-62-1145 and MS-AC-62-1233, Analytical Chemistry Subdivision, Mineral Sciences Division, Mines Branch.

MINERALOGY OF MILL PRODUCTS SUBMITTED BY G.O. HAYSLIP

The mill products submitted by G.O. Hayslip were separated into two portions. One portion was analysed by means of the X-ray diffractometer and the other was separated into fractions with heavy liquids, Frantz isodynamic separator, and the superpanner. The fractions were studied under binocular, petrographic and ore microscopes to determine the minerals and their textural relationships. Descriptions of the textural relationships of the minerals are included in the sections on mineralogy of the samples (see pages 5 to 17). The approximate mineral contents as determined by means of the X-ray diffractometer are given in Table 8. The results show that cassiterite is concentrated in sand table concentrates from Test B-4-8 and sphalerite is concentrated in magnetic cleaner concentrates from Test B-3-10. They also show that the magnetic middlings and tailings contain significant amounts of sphalerite.

TABLE 8

Approximate Mineral Contents of Mill Products Submitted by G.O. Hayslip

Sample	Minerals Present (Wt.%)										Assay Results (Wt.%)		
	Sl	Py	Asp	Cas	Zir	Tp	Fl	Chl	Qtz	Goe	Sn	Zn	Fe
-48+100 mesh Sand Table Conc. B-4-8	11.8			48.9	7.6		5.7	23		2.4	38.86		
-100+150 mesh Sand Table Conc. B-4-8	0.8			54.5	7.3			14.1		9.0	44.36		
-200 mesh Sand Table Conc. B-4-8	4.0			57.6	16.8	0.6		9.8		1.8	48.42		
Mag. Cl. Conc. Test B-3-10	80.0								5.0			44.70	14.80
Mag. Middlings Test B-3-10	30.0	4.0	5.0		2.0		5.0	5.0	20.0			16.50	
Mag. Tails Test B-3-10	40.0	2.0	2.0	2.0			2.0	2.0	15.0			13.80	

Legend

Sl = sphalerite
 Py = pyrite
 Asp = arsenopyrite
 Cas = cassiterite
 Zir = zircon

Tp = topaz
 Fl = fluorite
 Chl = chlorite
 Qtz = quartz
 Goe = goethite

Sn = tin
 Zn = zinc
 Fe = iron

CONCLUSIONS

The Mount Pleasant Mines tin deposit in New Brunswick contains a large variety of minerals, some of which may be of economic or strategic significance. The unusual mineralogical complexity revealed by this preliminary study indicates its academic significance. A detailed study of the deposits would therefore, seem to be amply justified.

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1. L.A. Clark, "The Fe-As-S System: Phase Relations and Applications", Ec. Geol. 55, 1345-1380 and 1631-1652 (1960).
2. G. Kullerud, P.B. Baxton and B.J. Skinner, "Effect of FeS on the Unit Cell Edge of Sphalerite", A Revision, Ec. Geol. 54, 1040 (1959).

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