O T T A W A June 10th, 1940.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 853.

Tin Ore from the Perseverance Mining
and Development Company Limited,
Rush Lake, Manitoba.

BUREAU OF MINES
DIVISION OF METALLIC MINERALS

ORE DRESSING AND
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CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Shipment:

A shipment of 1,000 pounds of ore was received on April 4th, 1940, from the Perseverance Mining and Development Company Limited, 350 Bay Street, Toronto, Ontario. This material was shipped from the company's property at Rush Lake, Lac du Bonnet district, Manitoba.

This shipment was made with the object of determining the presence of tin, tantalum and columbium, and also to make concentration tests for their recovery.

Sampling and Analysis:

The shipment was crushed and sampled. Analysis showed it to contain:

Tin (Sn) - 0.30 per cent.

Columbium oxide (Cb_2O_5) -
Tantalum oxide (Ta_2O_5) -) 0.23 per cent.

Beryllium (Be) - trace.
Silica (SiO_2) - 70.50 per cent
Calcium oxide (CaO) - 0.63 per cent.
Magnesium oxide (MgO) - 0.11 "
Iron (Fe) - 0.45 "
Aluminium oxide (Al_2O_3) - 17.06 "

plus Alkalies.

Characteristics of the Ore:

Samples of the ore were examined microscopically for identification of the minerals contained therein.

The only mineral visible under the binocular microscope that might contain the elements in question is in the form of microscopic brown crystals averaging about $\frac{1}{2}$ millimetre in size. These are very sparingly distributed in the gangue. They all appear to be the same material with the same crystal form and tests of quite a number of them from different pieces indicate that all those tested are cassiterite. A few pieces of a deep blue transparent mineral are also present. These have the optical properties of indicolite, a blue tourmaline.

Thin sections, representing as far as was

possible the various phases of the rock, were prepared and examined with the object of determining the mode of occurrence of the tin and, if possible, to discover the presence of any minerals which might contain other comparatively rare elements, such as beryllium, columbium, and tantalum.

Minerals Identified -

The minerals identified in the rock are as follows: albite (or a plagioclase feldspar very close to the end-member albite), quartz, mica (muscovite), apatite, cassiterite, and tourmaline. No minerals which normally contain the elements referred to above were identified.

Quantitative Analysis -

Traverses were made over all sections by the Rosewahl method, in order to obtain the approximate percentages of the minerals. Tables I to III give the results:

Table I.

Percentages of the Minerals by Volume.

Albite	-	66.19 per cent
Quartz	-	24.13 "
Muscovite	-	7.35 "
Apatite	-	1.96 "
Cassiterite	-	0.27 "
Tourmaline	-	0.10 "
Total	--	100.00 per cent.

Table II.

Percentages of the Minerals Calculated to Weight.

Mineral	Specific gravity assumed	Percentage by weight
Albite	2.61	65.05
Quartz	2.65	24.08
Muscovite	2.77	7.67
Apatite	3.20	2.37
Cassiterite	7.00	0.71*
Tourmaline	3.20	0.12*
	Total ...	100.00

* It is to be remembered that all of the results from quantitative microscopic analysis are at best only approximate. Particularly the percentages given for the minor constituents are subject to considerable error both in their variation throughout the samples and the consequent difficulty of obtaining a truly representative sample and because of the small quantities which must be measured.

Table III.

Theoretical Distribution of Chemical Constituents throughout the Rock According to the Minerals Identified.

(Per cent)

Mineral	Na_2O	K_2O	Al_2O_3	SiO_2	H_2O	P_2O_5	CaO	SnO_2	Totals
Albite	7.6	-	12.7	44.7	-	-	-	-	65.0
Quartz	-	-	-	24.1	-	-	-	-	24.1
Muscovite	-	0.9	3.0	3.5	0.3	-	-	-	7.7
Apatite	-	-	-	-	-	1.1	1.3	-	2.4
Cassiterite	-	-	-	-	-	-	-	0.7	0.7
Tourmaline	-- Quantities too small to distribute --								0.1
Totals	7.6	0.9	15.7	72.3	0.3	1.1	1.3	0.7	100.0

Grain Size of Cassiterite -

Cassiterite occurs as imperfect to rather well-formed crystals distributed somewhat unevenly through

the rock. The grain size as determined microscopically is shown in Table IV.

Table IV.

Grain Size of the Cassiterite.

Mesh	Size, in microns.	Percentage
+ 65 -	+208 -	59.3
- 65 +100 -	-208 +147 -	24.5
-100 +150 -	-147 +104 -	5.0
-150 +200 -	-104 + 74 -	4.4
-200 +280 -	- 74 + 52 -	2.1
-280 +400 -	- 52 + 37 -	1.8
-400 +560 -	- 37 + 26 -	1.6
-560 -	- 26 -	1.3
-	Total -	100.0 per cent.

Investigation Procedure:

Table Concentration.

In order to determine the grade of concentrate that could be expected by the known successful method of concentrating the tin ores, i.e., table concentration, a sample of the ore was ground wet in a ball mill to pass 65 mesh. This grind produced 83 per cent minus 200 mesh. This product was then passed over a Wilfley table and a concentrate was recovered.

Results of Test No. 1:

Product	Weight, per cent	Assay, Sn, per cent	Distribution, per cent
Feed (calculated)	100.0	0.31	100.0
Concentrate	0.5	22.50	36.1
Tailing	99.5	0.20	63.9

(Continued on next page)

(Table Concentration, cont'd) -

Test No. 2.

A second sample of the ore was ground 96 per cent minus 200 mesh and concentrated on the table.

Results of Test No. 2:

Product	Weight, per cent	Assay, Sn, per cent	Distribution, per cent
Feed (calculated)	100.0	0.28	100.0
Concentrate	0.6	17.58	37.1
Tailing	99.4	0.18	62.9

In both of the above tests, thin flat flakes of metal were observed in the concentrate. This apparently was zinc. Where this contamination took place is unknown.

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A sample of the table concentrate was super-panned and various products were separated. These were analysed spectrographically, with the following results:

No. 1. Zinc metal:

Strong	-	zinc.
Fairly strong	-	tin, lead.
Trace	-	magnesium, silicon.

No. 2. Iron:

Slightly magnetic.

Most iron with tin fairly strong.

No. 3. Cassiterite concentrate:

Strong	-	tin.
Fairly strong	-	iron, aluminium, chromium, manganese, silicon.
Weak	-	columbium, tantalum, magnesium.

(Continued on next page)

(Spectrographic analysis, cont'd) -

No. 4. Magnetic portion:

Fairly strong	-	iron, nickel, tin, copper, manganese.

No. 5. Light buff product:

Strong	-	beryllium, aluminium, tin, silicon.
Fairly strong	-	sodium, manganese, magnesium.
Weak	-	iron.

No. 6. Original table concentrate:

Strong	-	beryllium, tin.
Fairly strong	-	iron, columbium, tantalum, sodium, chromium, silicon, magnesium.
Trace	-	lead.

Flotation.

Preliminary tests by flotation were made to determine the response of the cassiterite to this form of concentration.

Owing to the presence of considerable mica in the ore, very low-grade concentrates were obtained. Microscopic examination of the tailing showed cassiterite in this product.

Considerably more research will be required to fully determine the applicability of flotation.

Electrostatic Separation.

Electrostatic separation showed no concentration of the tin.

Conclusions:

The ore is essentially one containing cassiterite in small quantities. Other rare elements, such as columbium and tantalum, are also present in small amounts.

Table concentration recovers less than 40 per cent of the tin, in a concentrate of very low grade.

It is suggested that should ore of commercial grade be encountered on the property a further shipment be forwarded for additional investigation.

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