

OTTAWA

June 5, 1945.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1881.

Concentration of Tantalite Ore from Bighill No. 2, near Hearne Channel, Great Slave Lake, Northwest Territories.

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(Copy No. 18.)

Note:

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#### Shipment:

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A box containing 44 pounds of ore was received on March 15, 1945, from A. W. Jolliffe, of the Bureau of Geology and Topography, Mines and Geology Branch, Department of Mines and Resources, Ottawa. Dr. Jolliffe stated that the shipment was submitted by Mr. G. De Staffany, Yellowknife, N.W.T.

### Location of the Property:

The shipment was taken from the property of the De Staffany Tungsten Gold Mines Limited. The ore was said to have come from the V vein, Bighill No. 2, near the Moose claims on Hearne channel, Great Slave Lake, in the Northwest Territories.

## Purpose of the Investigation:

The shipment was made to determine what amounts of tantalite, columbite and tin were contained in the sample.

#### Sampling and Analysis:

The shipment was crushed and sampled by standard methods and then was analysed for tantalum, columbium, tin, and beryllium. None of these minerals was detected by chemical analysis, but they were visible under the microscope in polished sections.

As there was such a small quantity of these minerals present in the ore, concentration followed by analysis of the concentrate was performed to obtain the values in the shipment.

Concentration showed that from one ton of feed, 5.75 pounds of concentrate, containing 44.80 per cent (Ta, Cb)205 and 39.15 per cent SnO2, would be recovered. This is equivalent to 0.129 per cent (Ta,Cb)205 and 0.12 per cent SnO2 in the original feed.

## Character of the Ore:

## ORE

Hand specimens and polished sections made from the sample were first inspected under ultra-violet radiation, and then were subjected to a careful megascopic and microscopic examination.

## Ultra-Violet Radiation -

All the hand specimens (2-to 3-inch lumps) available,

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(Character of the Ore, cont'd) -

six in number, were first examined under an ultra-violet lamp. While no luminescent mineral was revealed, it may be of interest to note that some dried moss or lichen clinging to the surface of one or two specimens gave a faint greenish yellow fluorescence. A similar test made on the polished surfaces showed no response whatever.

General Description -

The hand samples and polished sections are composed chiefly of coarse-textured white feldspar and quartz, which forms the matrix for the following minerals:

A light greenish yellow muscovite in minute scales and small "books" up to two or three centimetres in size is the most abundant mineral occurring in the quartz-feldspar groundmass.

Columbite-tantalite in small black masses, thin plates and irregular grains, ranging from about two centimetres down to twenty microns or less (800 Tyler mesh) in size, is sparsely and erratically scattered through the matrix. The polished surfaces of some of the masses are broken and fractured and contain small inclusions and veinlets of gangue (see Figure 1). Many of the smaller grains, however, appear to be composed of dense, well-polished material. A spectrographic analysis made of material taken from one of the masses shows strong traces of tin and tungsten and indicates iron to be more abundant than manganese.

Spodumene is present in one or two of the hand specimens as occasional, greenish grey, splintery crystals up to almost two centimetres in length.

One slightly fractured, hexagonal, barrel-shaped, pale greenish crystal of beryl, about one centimetre in length, is visible in one of the polished sections. This is the only - Page 4 -

(Character of the Ore, cont'd) -

evidence of the occurrence of this mineral in all the samples examined.

A few tiny, scattered, poorly polished flakes of graphite and probably a dozen small grains of pyrite are visible in the polished surfaces.

Conclusions -

1. With the possible exception of lithium minerals (spodumene and perhaps amblygonite), columbite-tantalite appears to be the only mineral sufficiently abundant to be of economic interest.

2. Included gangue will tend to lower the specific gravity of this mineral, but this tendency may be counteracted, to some extent at least, by the strong traces of tin and tungsten shown to be present spectrographically. Hence, caution may be needed in using specific gravity as an indicator of its tantalum content.

3. Cassiterite does not appear to occur in the sample --at least not in the specimens examined. In any case, it will concentrate with columbite-tantalite if present.

Note re. Microscopic Examination: - It must be remembered that these conclusions are drawn from the examination of six polished sections and six hand specimens (all that were available) and are true only in so far as they represent the sample as a whole. In this connection, too, the erratic distribution of economic minerals in pegmatites in general should be constantly borne in mind.

#### TABLE CONCENTRATES.

Since chemical analyses of table concentrates made from this ore sample show almost 40 per cent SnO<sub>2</sub>, screened table concentrates of columbite-tantalite were examined under the binocular microscope to see if anything could be learned as to how the tin occurs in them. No cassiterite was found in polished sections and hand specimens previously examined - Page 5 -

(Character of the Ore, contid) -

but the presence of this mineral was suspected.

Binocular Examination -

The -14 +20 mesh concentrate (the largest size) was first carefully examined under the binocular microscope. It is composed largely of particles of black columbite-tantalite but grains of pyrite, graphite, quartz, feldspar and mica are also present. The latter three minerals are commonly attached to metallics but some free grains are visible. A zinc reduction test made on about a half dozen selected grains proved one of them to be cassiterite.

A smaller size (-48+65 mesh) was next examined under the microscope and several reduction tests made with metallic zinc. The same minerals visible in the bigger size are present in this fraction also and the zinc reduction tests showed cassiterite to be somewhat more abundant.

Conclusions -

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The examination of table concentrates under the binocular microscope together with accompanying zinc reduction tests show that some cassiterite is present in this sample of pegmatite ore, but it does not appear to be so abundant as reported in the chemical analyses. However, probably a considerable proportion of the tin oxide is finely intergrown with columbite-tantalite and would not be reduced unless it came in actual contact with the zinc. The tests applied also indicate that the tin mineral tends to concentrate in the smaller sizes.

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(Character of the Ore, cont'd) -

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Figure 1.



PHOTOMICROGRAPH OF POLISHED SECTION OF GCLUMBITE-TANTALITE SHOWING ROUGH BROKEN SURFACE CONTAINING SMALL INCLUSIONS AND VINLETS OF GANGUE MATERIAL. A 200-Tyler screen opening is superimposed.

Columbite-tantalite = light grey, almost white. Gangue = grey Pits = black.

Magnification, X200.

### INVESTIGATIVE PROCEDURE:

The ore was crushed to pass through a 14-mesh screen. The crushed ore was screened on 20-, 35-, 48- and 65-mesh screens. The fractions obtained were -14+20, -20+35, -35+48, -48+65, and -65 mesh. The various fractions were tabled separately, giving a cleaner concentrate and a tailing. The tailings were reground and concentrated. The final products consisted of concentrates from each sized fraction and a minus 65 mesh tailing. Each concentrate was examined microscopically to determine the degree of grinding required to free the ore minerals from gangue.

A composite sample of all the concentrate fractions was made for chemical analysis.

#### EXPERIMENTAL TESTS:

Results of Table Concentration.

Products		Weight, per cent
Feed	-	100.0
Concentrate	-	0.3
Tailing	-	99.7

#### Concentrate

# Specific Gravity

-14 +20 mesh -20 +35	4.5 gm.	6.759
-35 +48 " -48 ÷65 -65	8.5 " 4.5 " 29.7 "	6.744 6.780 6.558
Total weight of concentrate -	58.2 gm.	

Weight of feed, 44.6 pounds.

Recovery of concentrate, in terms of pounds per ton of feed, 5.75 pounds per ton.

(Continued on next page)

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(Experimental Tests, cont'd) -

The composite sample of the concentrate was analysed and contained the following:

	Per Cent
(Ta, Cb)205	44.80
Shog	39,15
Siog	1.20
Tioz	0.50
Specific Gravity	6.360

HLB: WSJ:LB.

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