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CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 72-54

**MINERALOGICAL EXAMINATION OF TANTALUM
CONCENTRATES, DR-9 AND DR-10, FROM THE
TANTALUM MINING CORPORATION OF CANADA
LIMITED (TANCO), BERNIC LAKE, MANITOBA**

by

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MINERAL SCIENCES DIVISION

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COPY NO. 7

OCTOBER 1972

IR 72-54

89968668

Mines Branch Investigation Report IR 72-54

MINERALOGICAL EXAMINATION OF TANTALUM CONCENTRATES,
DR-9 AND DR-10, FROM THE TANTALUM MINING CORPORATION
OF CANADA LIMITED (TANCO), BERNIC LAKE, MANITOBA

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SUMMARY OF RESULTS

Examination of tantalum concentrates obtained from Tests DR-9 and DR-10 shows a high content of sulphide minerals (up to 20% by volume), which, if removed, could improve the Ta_2O_5 content to a marketable grade. The principal tantalum minerals are tantalite and wodginite, with most of the tantalum minerals containing tin. The principal sulphides are arsenopyrite and pyrite. In all the concentrates examined, the minerals are liberated with only the larger tantalite-wodginite grains ($>150\mu$) containing small gangue inclusions.

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INTRODUCTION

In May, 1972, Mr. D. Raicevic of the Mineral Processing Division, requested a mineralogical examination of tantalum concentrates from the Tanco orebody, Bernic Lake, Manitoba. The samples, labelled as Test DR-5, were studied and the results were reported in Investigation Report IR 72-39. The study showed unusually high contents of sulphide minerals ($\approx 20\%$) in the tantalum concentrates. Removal of the sulphides could improve the Ta_2O_5 content of the concentrates to a marketable grade.

Consequent to further beneficiation tests, more samples were submitted in August, 1972, for mineralogical examination. These were ore samples labelled Test DR-9, November 18, 1971, and Test DR-10, June 2 to 5, 1972. The results of the mineralogical study is given in this report.

METHOD OF INVESTIGATION

Polished sections were prepared from the concentrates, examined under an ore microscope to identify the minerals, their grain sizes, and their textural relationships. Grain counting techniques were employed to determine the mineral proportion. All mineral compositions were obtained by electron microprobe analyses of the polished sections.

MINERALOGY

The mineralogy of the concentrates are similar. The principal tantalum-bearing minerals are tantalite, wodginite, and microlite. Microlite is rare in the ore. Cassiterite and wodginite are the principal tin minerals, with up to 17.8% SnO_2 being detected in the wodginite grains.

The principal sulphide minerals are arsenopyrite and pyrite with minor amounts of pyrrhotite, chalcopyrite, galena, native bismuth, niccolite, and stannite.

Samples from Milling Test DR-9, November 18, 1971

Table 1 gives the results of the beneficiation tests and grades of the various fractions obtained by D. Raicevic of the Mineral Processing Division.

Coarse Tantalum Cleaner Concentrate

A high proportion of sulphide minerals were noted in this concentrate (Figure 1). Based on grain counting, the sulphides represent approximately 22% by volume, ilmenite 4%, with the tantalum-bearing phases and the gangue minerals accounting for the remainder. Cassiterite is the principal tin mineral, although most of the tantalite-wodginite grains contain tin. Microprobe analyses of 13 grains, selected at random, gave an average composition of Ta_2O_5 -70.2, Nb_2O_5 -3.3, SnO_2 -13.3, TiO_2 -3.0, MnO -8.9, FeO -2.6, total 101.3 wt %. Almost every tantalite-wodginite grain larger than 150μ contains inclusions of gangue minerals.

Scavenger Tantalum Concentrate #1

In comparison to the coarse tantalum cleaner concentrate, this fraction contains a higher sulphide content, more ilmenite, iron spherules, and magnetite grains (Figure 3).

Removal of the magnetic fraction with a hand magnet shows that it represents 4.5 wt % of the sample. Based on grain counting, the proportion of the following fractions were noted: Ta minerals, 54.0%; ilmenite, 16.0%; sulphides, 20.0%; and gangue, 10.0%.

Scavenger Tantalum Concentrate #2

This sample contains 12% sulphides, whereas no magnetic grains were noted (Figure 5). The sample is too fine-grained to permit examination in more detail.

Scavenger Middlings #1 (+325)

This sample consists mainly of gangue minerals with minor amounts of liberated Ta-minerals and sulphides.

Scavenger Middlings #2 (-325)

The Ta minerals are more abundant in this sample than in Middlings #1. They occur as liberated grains generally finer-grained (up to 40 μ) than the gangue minerals, with 20- μ grains commonly observed.

In order to determine whether more Ta minerals occur in the finer fractions, screening and heavy liquid (3.6) separations were made. The results of this study are:

<u>Fraction</u>	<u>%</u>	<u>Float %</u>	<u>Sink %</u>
Plus 400-mesh	70.1	65.9	4.2
Minus 400-mesh	29.9	16.5	13.4
	<u>100.0</u>	<u>82.4</u>	<u>17.6</u>

Although the minus 400-mesh fraction weighs less than the plus 400-mesh fraction, it contains more heavy minerals.

Samples from Milling Test DR-10, June 2 to 5, 1972

The concentrations submitted for examination and their assay values are listed in Table 1.

Coarse Tantalum Cleaner Concentrate

In comparison with the coarse tantalum cleaner concentrate of DR-9, this sample contains fewer sulphides and appears to be finer-grained with most of the grains being smaller than 50 microns in diameter (Figure 2). The larger Ta-fragment contains gangue inclusions but these are not as abundant as in DR-9. Grain counting gave the following proportions: Ta-minerals, 84%; sulphides, 6%; ilmenite, 1%; gangue, 9%.

Scavenger Tantalum Concentrate #1

The main difference between this concentrate and the coarse tantalum cleaner concentrate is its higher sulphide content; see Figure 4.

Scavenger Tantalum Concentrate #2

This fraction was so fine-grained that grain counting was impossible (Figure 6). Sulphides were usually estimated at between 5 and 10%. Several magnetite and metallic particles were noted. These were removed by hand magnet and represented 4.1 wt% of the sample.

TABLE 1

Test DR-9, (Sample of November 18, 1971)

Product	Wt %	Ta ₂ O ₅ %	SnO ₂ %	Sulphides Vol. %
Coarse Ta Cl. Conc	0.125	40.18	10.04	22.0
Scav. Ta Conc #1	0.050	31.45	7.67	20.0
Scav. Ta Conc #2	0.021	43.02	16.83	12.0
Scav. Midds #1 (+325)	0.126	3.76	-	-
Scav. Midds #2 (-325)	0.196	8.10	-	-
Rougher Tail	43.57	0.005	-	-
Scav. Tail #1 (+325)	22.50	0.127	-	-
Scav. Tail #2 (-325)	33.41	0.005	-	-
Total Tail	99.48	0.033	-	-
Total Feed	100.00	0.128	-	-

Test DR-10, (Sample of June 2 to 5, 1972)

Coarse Ta Cl. Conc	49.40	12.02	6
Scav. Ta Conc #1	44.48	8.53	10-13 (11.0)*
Scav. Ta Conc #2	53.11	12.21	5-10 (6.0)*

*Determined with the Quantimet by Dr. Petruk.

SUMMARY

In all the fractions examined, the Ta minerals were liberated. The larger tantalite-wodginite grains ($>150\mu$) contain small inclusions of gangue minerals but further grinding would probably result in a higher loss in the tailings. The high content of sulphide minerals in some of the concentrates is an important factor; if the sulphides were removed, the Ta_2O_5 concentrates could be of marketable grade. This aspect is clearly shown in Table 1 (Test DR-10) where concentrates with marketable Ta_2O_5 contents, have correspondingly lower sulphide contents. In addition, the finer grain size of the DR-10 concentrates, in comparison with those of DR-9, has resulted in improved liberation of the Ta-minerals.

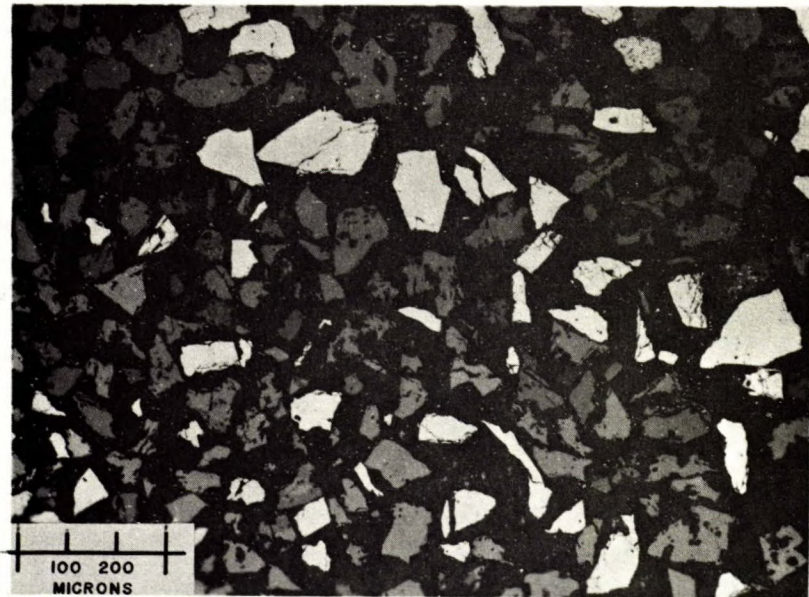


Figure 1.* Photomicrograph of the sulphide grains (white) in DR-9 cleaner concentrate.

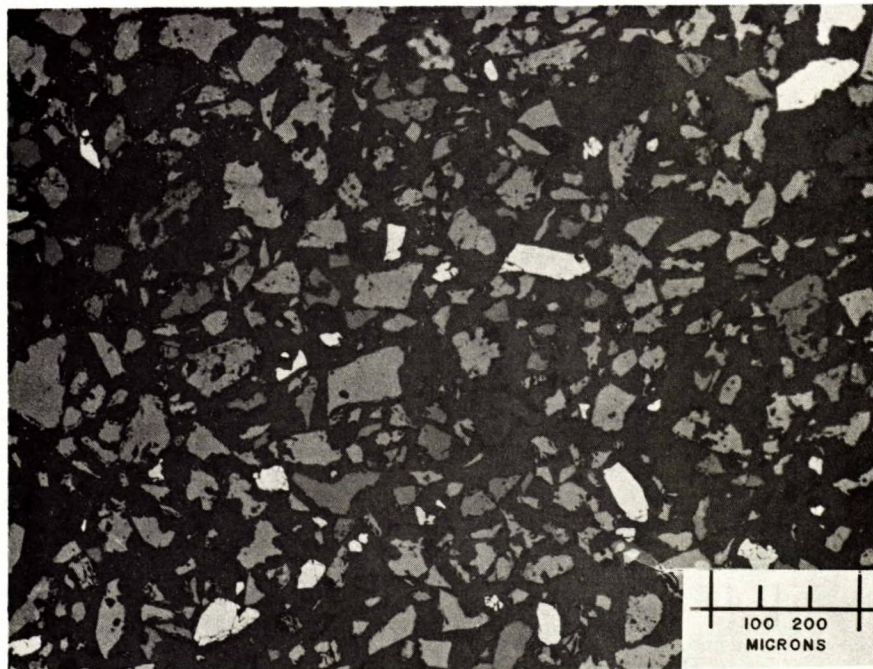


Figure 2.* Photomicrograph of the sulphide grains (white) in DR-10 cleaner concentrate.

*The photomicrographs in this report are arranged so that the equivalent fractions in DR-9 and DR-10 appear together for comparison purposes.

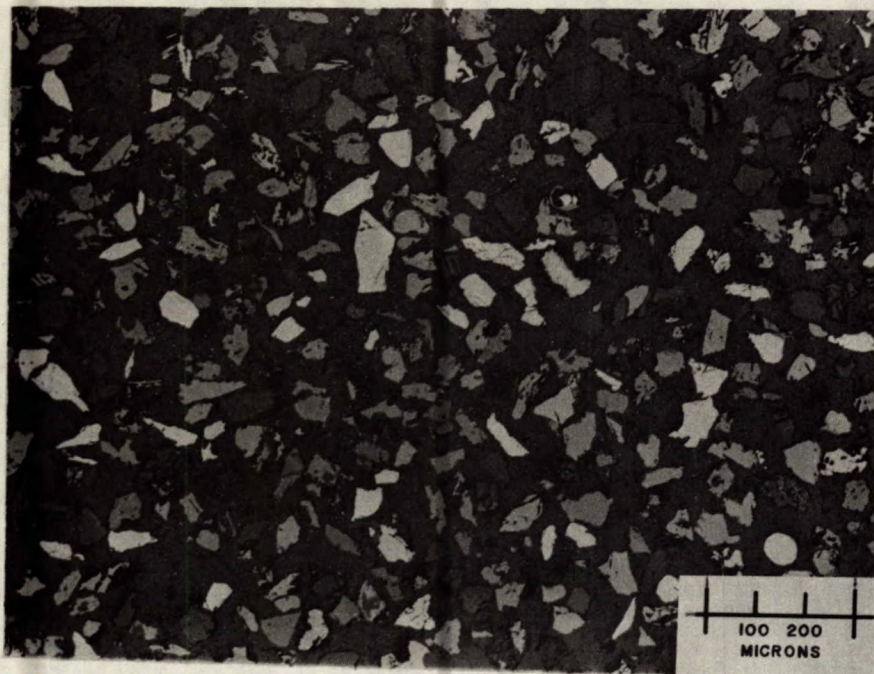


Figure 3. Photomicrograph of the sulphide grains (white) in DR-9 scavenger concentrate #1. An unusually high ilmenite content was noted in this sample.

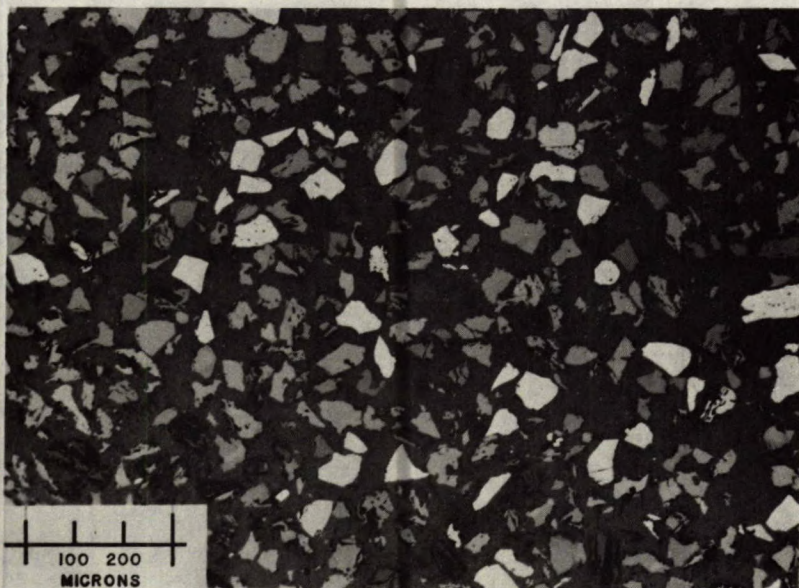


Figure 4. Photomicrograph of the sulphide grains (white) in DR-10 scavenger concentrate #1.

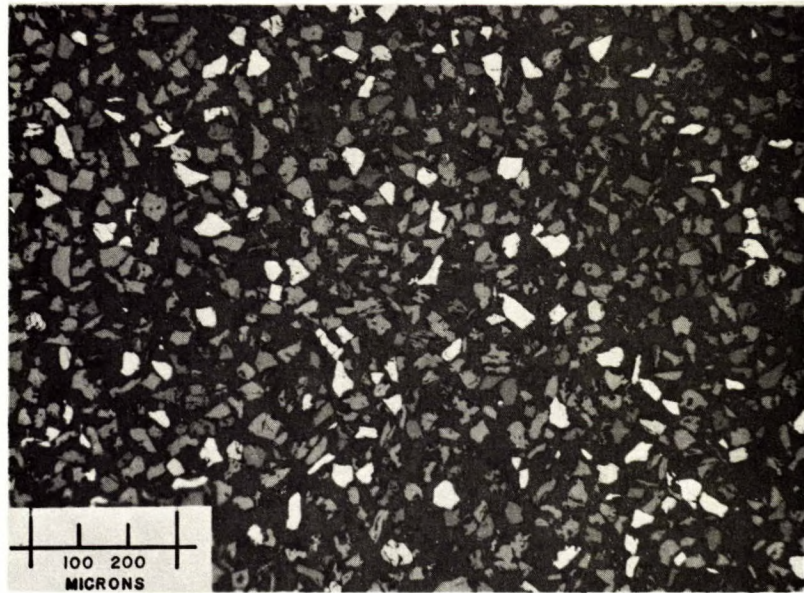


Figure 5. Photomicrograph of the sulphide grains (white) in DR-9 scavenger concentrate #2.

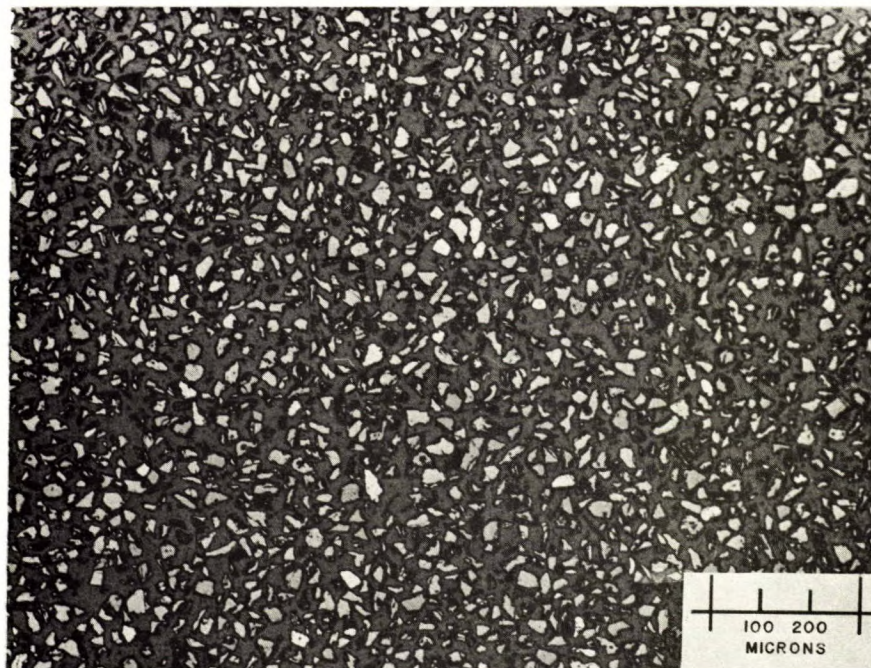


Figure 6. Photomicrograph of the sulphide grains (white) in DR-10 scavenger concentrate #2.