

TRIA-201-205

R.597. Tin recovery tests for D. M. Lewis, Coles Bay

Seven samples were submitted by D. M. Lewis from Coles Bay for tin recovery tests.

The samples appeared to be river wash with varying amounts of clay, sand and gravel. The samples ranged in weight from 54-74 lb. The samples are identified as follows:

Registered No.	Lewis No.
691725	1
691726	2
691727	3
691728	4
691729	5
691730	6
691731	7

NOTE: (1) No responsibility will be accepted for the results shown in this report except in so far as they apply to the samples tested.

(2) All screens used were from the British Standard Screen Series unless otherwise stated.

TEST WORK

Each sample was screened on a $\frac{1}{4}$ -inch screen. The oversize on the screen, including large clay lumps, was pulped in a bucket with water and wet screened on the $\frac{1}{4}$ -inch screen. The + $\frac{1}{4}$ -inch material from the wet screening was given no further treatment. The - $\frac{1}{4}$ -inch material from the wet screening was dried

and again screened on the $\frac{1}{4}$ -inch screen. Any caked material was broken on the screen until it passed through the screen. This $-\frac{1}{4}$ -inch material was then put with the $-\frac{1}{4}$ -inch material from the original screening.

The combined $-\frac{1}{4}$ -inch material was then passed over a 6-inch x 4-inch Denver jig. The ragging used was $\frac{1}{4}$ -inch iron shot with an equal amount of pyrrhotite particles of comparable size placed above the iron shot for a total depth of ragging of about 2 inches. Stroke length on the jig was $\frac{3}{8}$ -inch and the stroke frequency was 240 per minute. The hutch screen was 8 mesh and the hutch water addition 5.9 gal/ft².

The jig concentrate and the bedding in the jig at the end of each test were screened on 10 mesh, 22 mesh and non-standard 40 mesh screens. The $+10$ mesh fraction was sorted to remove iron shot ragging and pyrrhotite ragging. The remainder was concentrated in a dish, and any heavy mineral was set aside to be added to the final concentrate. The $-10 + 22$ mesh fraction, the $-22 + 40$ mesh fraction and the -40 mesh fraction of the jig concentrate were concentrated separately on the Deister table. The concentrates from each tabling were bulked to give the final concentrate for each test.

NOTES ON THE TESTS:

Lewis No.		Ref. No.
691725	1	A lot of clay material was present, and required breaking up to ensure recovery of cassiterite.
691726	2	A little clay material was present, and required breaking up to ensure recovery of cassiterite.
691727	3	Mostly sand. Some $+10$ mesh cassiterite was present. A lot of organic matter present in the sand. The presence of the organic matter made the sand hydrophobic and a lot of the sand floated over the jig on the surface of the water. The jig tail was passed over the jig again in a wet state to ensure recovery of cassiterite.
691728	4	Some clay material was present which required breaking up to ensure recovery of the cassiterite.
691729	5	One $+6$ mesh cassiterite particle present.
691730	6	One $+6$ mesh cassiterite particle present.
691731	7	No comment.

The final concentrates from each sample were riffled. One-half of the concentrate was retained, one-quarter was pulverised for tin assay, and one-quarter was put into a composite of all the samples.

The composite sample was riffled, one-quarter was pulverised and assayed for tin, titanium and zirconium and the remainder was sized on 18, 25, 36, 52, 72, 100 and 150 mesh screens. Individual size fractions were assayed for tin, titanium and zirconium.

RESULTS

The concentrate assays of the individual tests are shown below, together with the recovered grade of the feed expressed in lb/ton:

Reg. No.	Lewis No.	Product	% Weight	Tin assay
691725	1	C	2.58	14.3%
		F/D	100.0	8.27 lb/ton
691726	2	C	1.93	7.10%
		F/D	100.0	3.08 lb/ton
691727	3	C	0.97	6.98%
		F/D	100.0	1.51 lb/ton
691728	4	C	1.64	11.5%
		F/D	100.0	4.22 lb/ton
691729	5	C	0.60	1.38%
		F/D	100.0	0.19 lb/ton
691730	6	C	2.17	21.9%
		F/D	100.0	10.66 lb/ton
691731	7	C	0.85	1.67%
		F/D	100.0	0.32 lb/ton

The sizing analysis of the composite concentrate with the assays and distribution of tin, titanium, and zirconium is given in Table 1.

CONCLUSIONS

The samples submitted were very variable in grade.

Some of the samples contained varying amounts of clay and it was necessary to pulp the clay lumps to ensure that all the cassiterite particles were free to be concentrated by the jig. Sample No. 1 (Reg. No. 691725) was one of the richer samples, but contained a major proportion of clay.

Sample No. 3 (Reg. No. 691727) contained a lot of organic matter which made it difficult to wet the sand. For complete cassiterite recovery on a jig it would be essential that this feed be thoroughly wet before it passed over the jig.

The cassiterite is relatively coarse. Titanium minerals are finer than the cassiterite and zircon is finer than the ilmenite. By screening the bulked concentrate the cassiterite can be separated from the other minerals. Screening at 36 mesh recovers 80.2% of the cassiterite in the concentrate with 3.6% of the titanium minerals and 0.3% of the zircon in the oversize product. Screening at 52 mesh recovers 93.2% of the cassiterite in the concentrate with 14.4% of the titanium minerals and 0.7% of the zircon in the oversize product.

Although no test was done to confirm this, visual observation indicates that ilmenite is coarser than rutile in the concentrate. It is believed that the rutile is comparable with the zircon in size.

Treatment recommended for the material represented by the samples submitted for treating 40 ton/hr would be as follows:

Screen feed at $\frac{1}{4}$ inch. Stockpile oversize, as large clay lumps may contain cassiterite.

Feed undersize to jigs fitted with 8 mesh screens with a total jigging area of about 50 ft².

Feed primary jig concentrate to a small cleaning jig similar to a Warman-Wemco pilot jig.

Screen secondary jig concentrate on 22, 30 and 52 mesh screens and store size fractions for separate treatment on a table to produce a final concentrate.

Clay lumps may be broken up by a log washer or similar device at a later date for recovery of the cassiterite enclosed in the clay.

A wetting agent added to the feed may counteract the hydrophobic nature of the sand in sample No. 3 (Reg. No. 691727).