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REPORT
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ORE DRESSING AND METALLURGICAL LABORATORIES

Report No. 218

Concentration of titanite (sphene) from pegmatite
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Shipment: A shipment of 42 pounds of pegmatite rock containing titanite, or sphene, was submitted by Messrs. Spence and Cole of the Mines Branch, Ottawa.

Source of Shipment: The shipment was obtained from a deposit located on lot 3, concession III, Allevyn township, Hull county, Quebec.

Analysis: The sample assayed 5.03% titanium oxide (TiO₂) contained in the mineral sphene.

Character of the rock: The sphene was associated with a considerable quantity of dark green hornblende and some calcite in a quartz pegmatite.

Experimental Tests

General considerations: The rock was tough and difficult to crush. Crushing costs would be a chief factor in the treatment. The reduction of the rock was therefore not carried any further than necessary, only to the point of separation of the sphene from the quartz-calcite-hornblende gangue. The sphene is more brittle than the gangue and consequently crushes finer, but in parting from the gangue especially the quartz, a thin shell of sphene is left attached. Fine grinding would be required to free this adhering shell, but this operation would not be economical. In view of the above considerations, the procedure followed was to rough out a clean tailing at as coarse a size as possible, so that any re-crushing required to obtain a cleaner product would be done on a smaller amount of material.

General description of tests: By crushing a sample to different degrees of fineness and carefully examining the sizes, it was determined that -3 mesh was the coarsest size from which there was any likelihood of obtaining a sufficiently clean tailing. The size -3+10 was jigged, and a final tailing and rougher concentrate made. The concentrate contained the greater part of the hornblende which has practically the same specific gravity as sphene. Considerable other gangue was also present. It was noticed in the crushing tests that when the sphene broke free from the quartz, a thin shell of it was left attached to the quartz. This tended to increase the loss in the tailing, but it was found impossible to free this shell without very fine crushing which would hardly be warranted from an economical standpoint. A concentrate and tailing were made

from this -3+10 size. The concentrate was re-crushed to 20 mesh and re-treated as described later. The -10+20 mesh material was jigged, and a concentrate and final tailing only made. This concentrate was also re-crushed. The -20 mesh material was tabled without further sizing. A final table tailing was made and a table concentrate which was added to the re-crushed concentrate from the jig. All the re-crushed concentrate was sized and re-cleaned on tables producing a sphene hornblende product and a secondary tailing which was not further treated. The sphene hornblende product was fed to an Ullrich magnetic separator and the hornblende was removed, leaving a sphene concentrate containing some quartz.

Results of tests: The weights of the sizes obtained by crushing to 3 mesh were as follows:

Total weight of sample		42 lbs.
Assay		5.03% TiO ₂
Content		2.1126 lbs TiO ₂
-3+10 mesh	weight	30 lbs.
	% total weight	71.44
-10+20 mesh	weight	6 lbs
	% total weight	14.28
-20 mesh	weight	6 lbs.
	% total weight	14.28

Results of jigging -3+10 mesh material:

Tailing	weight	19 lbs.
	Assay	0.90% TiO ₂
	Content	0.152 lbs TiO ₂

Summary: 45.2% of the original sample of 42 pounds was eliminated as a final tailing containing 7.2% of the total titanium oxide (TiO₂)

Results of jigging -10+20 mesh material

Tailing	Weight	3.48 lbs.
	Assay	0.50% TiO ₂
	Content	0.0174 lbs TiO ₂

Summary: 8.28% of the original sample of 42 pounds was eliminated as a final tailing, containing 0.82% of total titanium oxide (TiO₂)

Results of table concentration -20 mesh:

Tailing	weight	2.88 lbs.
	Assay	1.0% TiO ₂
	Content	0.0288 lbs TiO ₂

Summary: 6.85% of the original sample was eliminated as a final tailing containing 1.365% of the total TiO₂

Recapitulation of results

Product	Weight		Analysis TiO ₂ %	Content lbs. TiO ₂	Percent of values
	lbs.	%			
Final concentrate	4.00	10.0	29.84	1.20	65.3
" middlings	1.75	4.4	7.61	0.133	7.3
" tailing	25.50	63.7	0.60	0.196	10.7
" secondary tailing	2.50	6.3	2.0	0.05	2.7
" hornblende product	4.25	10.6	1.1	0.046	2.5
-100 mesh product	2.00	5.0	10.58	0.212	11.5
Total	40.00	100.00	4.6	1.837	100.0

Summary: The results of the above concentration tests show a concentration ratio of 10 of rock to 1 of concentrate. The concentrates averaged 30% TiO₂ with a recovery of 65% of the

titanium content in the rock. This recovery could probably be increased to 70% or 75% by further treatment of the middling product, and concentration of the fines.