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R.693. Upgrading of a tasmanite concentrate.

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A sample of tasmanite concentrate (742551) was taken for examination and possible upgrading by the Chief Chemist & Metallurgist from a pile in a shed at the remains of the old pilot plant near Latrobe. This examination was undertaken to obtain information for the Endeavour Oil Co. N.L. who are exploring the shale deposits.

A head sample was cut from the bulk sample for assay purposes and a number of samples were cut for sizing and flotation tests. A screen analysis was conducted on one of the samples taken from the bulk sample and the screen fractions were assayed for ash.

Two flotation tests using dispersing agents and multi-stage cleaning were conducted, and one further test involved grinding the sample for 15 minutes prior to flotation. The concentrate produced in this latter test was subjected to a screen analysis and the screen fractions were assayed for ash.

RESULTS

The head sample for assay was oven-dried at 105°C and then assayed on an oven-dried basis for sulphur and loss on ignition with the following results:

sulphur 2.8% loss on ignition 68.0%

It was apparent by the odour that some volatile matter was driven off at this temperature. Another sample of the tasmanite concentrate was placed in the oven and subjected to increasing heat levels, and the loss was measured as follows:

Temperature °C	% Loss	Cumulative % Loss
55	1.36	1.36
55-65	0.47	1.83
65-80	0.18	2.01
80-95	0.06	2.07
95-105	0.01	2.08

The ash resulting from ignition of the tasmanite concentrate was analysed with the following result:

	%		%
SiO ₂	70.3	Ti	0.4
Ca	2.4	Na	0.6
Fe	11.2	Ni	<0.1
V	0.08	S	2.2

The sizing analysis and ash distribution of the tasmanite concentrate are given below. All ash determinations on samples were done on an air-dried basis.

Aperture μm	% mass	Cum. % mass	% Ash	Ash distribution	
				%	cum. %
+300	1.7	1.7	28.4	1.5	1.5
+212	8.7	10.4	24.2	6.5	8.0
+150	10.0	20.4	27.0	8.3	16.3
+106	15.6	36.0	26.7	12.9	29.2
+75	13.1	49.1	27.3	11.1	40.3
+53	10.8	59.9	28.3	9.5	49.8

Aperture μm	% mass	Cum. % mass	% Ash	Ash distribution	
				%	cum. %
+38	10.7	70.6	34.0	11.3	61.1
-38	29.4	100.0	42.7	38.9	100.0
Calculated head 100.0			(32.3)		

The results of the two flotation tests in which dispersing agents were used are as follows:

Test	Operation	Reagent	Quantity kg/t	Product	% mass	% Ash	% Ash distn
N1	F1	Calgon	3.5	T	15.4	56.2	27.1
	F2			T	2.9	54.0	4.9
	F3			T	1.1	57.6	1.9
	F4			T	0.8	58.3	1.5
		C	79.8	25.9	64.6		
Calculated head					100.0	(32.0)	100.0
N2	F1	alkanate ND	0.7	T	7.4	69.4	16.4
	F2			T	4.0	47.7	6.1
	F3			T	2.3	59.7	4.4
	F4	Calgon	3.3	T	1.2	43.2	1.7
	F5			T	1.2	56.9	2.0
				C	83.9	25.9	69.4
Calculated head					100.0	(31.3)	

A drop of Teric 401 was used as a frother as required to maintain adequate froth in test N1, and a drop of fuel oil in addition to the frother was used as required in test N2.

The flotation concentrate from tests N1 and N2 were examined under the microscope, and it was noticed that a large proportion of the siliceous material appeared to be compacted into flattened tasmanite spores.

From their appearance it seemed that attrition in an abrasive medium may be sufficient to remove the siliceous material. An alternative method was to try further grinding.

Accordingly a further test was made in which the tasmanite concentrate was ground in the 20 cm x 20 cm diameter Warman laboratory ball mill at 43% solids for 15 minutes, and then subjected to flotation with the following results:

Test	Operation	Product	% mass	% Ash	% Ash distribution
N3	F1	T	25.7	78.0	62.4
	F2	T	6.7	47.9	9.9
	F3	T	0.8	59.2	1.5
		C	66.8	12.6	26.2
Calculated head			100.0	(32.2)	100.0

Teric 401 and fuel oil were added to rougher flotation F1. A summary of the three flotation tests is as follows:

Test	Product	% mass	% Ash	% Ash distn
N1	C	79.8	25.9	64.6
	Total T	20.2	56.0	35.4
N2	C	83.9	25.9	69.4
	Total T	16.1	59.7	30.6
N3	C	66.8	12.6	26.2
	Total T	33.2	71.5	73.8

The flotation concentrate from test N3 was subjected to a sizing analysis, and the ash distribution was determined with the following result:

Aperture μm	% mass	Cum. % mass	% Ash	Ash distribution	
				%	cum. %
+212	3.6	3.6	10.2	2.9	2.9
+150	7.5	11.1	11.8	7.1	10.0
+106	17.6	28.7	11.1	15.7	25.7
+75	19.1	47.8	9.5	14.5	40.2
+53	14.8	62.6	11.0	13.1	53.3
+38	14.8	77.4	12.6	15.0	68.3
-38	22.6	100.0	17.5	31.7	100.0
Calculated head 100.0			(12.5)	100.0	

CONCLUSIONS

Further flotation of the tasmanite concentrate with dispersing agents followed by multi-stage cleaning yielded a product assaying 25.9% Ash.

Grinding of the tasmanite concentrate followed by flotation yielded a product assaying 12.6% ash. The flotation tail so produced was much higher in ash content than that obtained by flotation only, which indicates that grinding has liberated more siliceous material from the tasmanite spores.

[1 May 1975]