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CONCENTRATION OF BARITE FROM A SAMPLE OF TAILINGS FROM GIANT MASCOT MINES LIMITED

SUBMITTED BY

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by

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CONCENTRATION OF BARITE FROM A SAMPLE OF TAILINGS FROM GIANT MASCOT MINES LIMITED SUBMITTED BY HENRY L.HILL AND ASSOCIATES, VANCOUVER B.C.

A sample of around 100 pounds of dry tailings from Giant Mascot Mine tailings pond was received with a request for information on the best method for recovering the barite content simply, and also on certain pieces of equipment in the present mill which it is hoped may be employed.

Mineralogy

A microscopic examination showed that the prominent constituents in the sample are barite, calcite, quartz and dolomite and some fine grained micaceous aggregates. Isolated grains of pyrite and chalcopyrite were also observed.

Examination of barite concentrates running 96% $BaSO_4$ showed that the barite itself has a yellowish cast rather than dead white. A few dark grains present in this concentrate are either dark-red and translucent, or greenish-yellow. The former are probably iron oxides and the latter micaceous.

Examination of tails following barite removal, (barite content 2%) showed chiefly quartz and carbonates present, with odd grains of pyrite. The grains of both quartz and carbonates were heavily contaminated by small dark inclusions, which sometimes renders the grain almost opaque.

Prospects of obtaining a product of sufficiently high reflectivity to make paint pigment are therefore slight.

Test Work

A representative portion of the sample was isolated for laboratory test work and a screen analysis was made:

+100	mesh	2.8%
+325	"	11.6%
-325	"	85.6%
		100.0%

It was immediately apparent that the +325 mesh material was composed largely of dark coloured particles, quartz and carbonates, with only a small amount of the lighter coloured barite. Chemical analysis confirmed this, giving a 17% $BaSO_4$ content for the +325 mesh fraction and 55% for the -325 mesh fraction, or a barite content of 50% for the sample as a whole.

The material was found to pulp easily in water with the lumps disintegrating rapidly under agitation.

For an exploratory trial 500 grams was pulped and filtered with several washings to remove any reagents remaining from the earlier milling. Clean cake was then repulped and conditioned with 0.4 pounds per ton of sodium silicate and 0.2 pounds per ton of quebracho for one minute. Following this 0.8 pounds per ton of an ocenol sulphate (Duponol LS) was added in three stages with froth removal following each stage. Combined froth was then cleaned once by refloating to give a concentrate containing 82% $BaSO_4$ for a

recovery of 88% of the barite.

Since this procedure gave such strong indications of being satisfactory the next step was to work out improvements in the system in order to bring up grade. The final product is required to be -325 mesh. The material is already 85% -325 mesh and most of the barite is contained in that fraction. Logically, therefore, the +325 mesh should be discarded, or treated separately.

A separation at 325 mesh was effected on some of the feed and the +325 was run over a slimes table to obtain the following results:

	Weight %	$BaSO_4$%	Recovery %	Recovery(% of original feed)
Concentrate	15.8	88.2	93	2.5
Middlings	10.8	2.68		
Tails	73.4	.92		
	100.0			

The -325 mesh was treated to a similar flotation procedure to that described above with the following results

	Weight %	$BaSO_4$%	Recovery %	Recovery(% of original feed)
Concentrate	51.5	88.3	82	79
Middlings	23.9	35.6		
Tails	24.6	7.9		

Although these results were fair a further improvement in the system was sought in order to obtain a better grade of concentrate. Details of this test are given below:

Feed: -325 mesh washed on filter 3 times.

Conditioning: Filter cake pulped and conditioned 1 minute with 0.45 pounds per ton of sodium silicate and 0.25 pounds per ton of Quebracho.

Rougher Float: (1) 0.45 pounds per ton Duponol LS added and froth removed for 4 minutes.

(2) 0.45 pounds per ton Duponol LS added and froth removed for 4 minutes.

Cleaner 1 Float: (1)&(2) froth combined and refloated after adding 0.22 pounds per ton sodium silicate and 0.1 pounds per ton of Quebracho. Froth removed 4 minutes.

Cleaner 2 Float. Clean«1 froth refloated with 0.22 #/T silicate and 0.1 #/T Quebracho. Froth removed 3 minutes.

Cleaner 3 Float: Cleaner 2 froth refloated with 0.1#/T Quebracho Froth removed 3 minutes.

Cleaner 4 Float: Cleaner 3 froth refloated no extra reagents. Froth removed 3 minutes.

RESULTS

	Wt.%	BaSO4%	Recovery %	Recovery(% of Original Feed)
+325 mesh	-	-	-	4.8
Rougher Tails	17.9	6.61	2.0	1.9
Cleaner 1 "	24.8	25.60	11.0	10.5
" 2 "	5.0	33.77	2.9	2.8
" 3 "	2.7	51.16	2.5	2.3
" 4 "	1.0	59.15	1.0	1.0
Concentrates	48.6	95.56	80.6	76.7
	100.0		100.0	100.0

Both recovery and grade were good with the above system. It will be noted that more than 17% of the barite wound up as cleaner tailings, a good deal of which would be extracted by recirculation. A further recovery could be made by tabling the +325 separately and adding in the product.

Density determinations for the 88% $BaSO_4$ concentrate and the 95.6% $BaSO_4$ concentrate gave 4.35 and 4.47 respectively. Reflectivity determination on the 95.6% $BaSO_4$ product showed a brightness of 76%.

COMMENTS

It is very unlikely that this material would make paint pigment, although it should be quite acceptable for drilling mud. The recovery system would appear to be fairly straightforward and has only one disadvantage - in the flotation a very voluminous and persistent froth is formed which does not yield readily to sprays. It might be necessary to filter and repulp some of these froths between flotation steps, although simply passing them through a pump should do.

Density of 15-18% solids was used in the laboratory work. Should a similar density be employed the 29 flotation cells available in the existing plant, divided into 4 banks of 6 and one bank of 5 cells, would provide a capacity of around 300 tons per day.

The following method of handling might be considered:

(1) Either hydraulic the tailings to a pumping point or bulldoze to a pulping sump.

(2) Pump to the plant and through a cyclone set to produce a cut at close to 325 mesh.

(3) Overflow to a thickener to obtain washing, and also density control to the flotation circuit.

(4) Thickener underflow to a small conditioner where about 0.04 pounds per ton sodium silicate and 0.2 pounds per ton of Quebracho added.

(5) Conditioner discharge to bank of 6 rougher cells. 0.8-0.9 pounds per ton of Duponol LS added in steps to this bank. Tails to waste.

(6) Rougher froth to cleaner one, 6 cell bank, with 0.2 pound per ton sodium silicate and 0.1 pound per ton Quebracho added. Tails returned to rougher.

(7) Cleaner 1 froth to cleaner two, 6 cell bank, with similar amounts of reagents added. Tails to cleaner 1.

(8) Cleaner 2 froth to cleaner three, 6 cell bank, with 0.1#/T. Quebracho added if necessary. Tails to cleaner 2.

(9) Cleaner 3 froth to cleaner four, 5 cell bank, no reagents. Tails to cleaner 3.

(10) Cleaner 4 froth to small thickener.

(11) Thickener underflow to filter.

(12) Filter cake to drier.

In addition the cone underflow could be fed to a slime table if desired and the table concentrate ground to -325 mesh for addition direct to concentrate, or if too low grade to flotation feed.

Such a circuit would, of course, be approximate and would require reagent adjustments, and possibly some froth thickening if much water is needed to move froth through launders.

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