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## MICA, GLADSTONE FLOTATION

### PRODUCTION OF MICA CONCENTRATE FROM GREISENIZED GRANITE

#### Sample

A 150 lb. sample of greisenized granite from the Old Fly-by-Night Mine at Gladstone was received on the 1st December, 1960. The material consists essentially of muscovite mica and quartz, with a small amount of feldspar and feldspar decomposition minerals. Flotation tests were carried out to test the practicability of producing high grade mica concentrate.

#### Summary

Laboratory tests have shown that a relatively high grade mica concentrate can be produced by flotation from the deslimed material using cationic reagents at low pH. About 20-25% by weight of the raw material can be recovered as high grade mica concentrate. Lack of specification and economic data from potential consumers at present prevent a proper assessment being made of the process as an economic project.

#### Investigation

*Nature of the material.* A sample of the material was separated into a series of closely sized fractions. The mica content of each fraction was obtained by separating each fraction into a mica concentrate and a quartz tailing, using the reagent Arquad 12/50 at pH 2.5. The flotation products were examined microscopically, and it was found that the mica concentrate contained about 95% mica, and that the quartz tailing contained about 2.5% mica.

#### Sizing and Mica Content

	Fraction B.S. Screen	Percent Weight	Estimated Mica Content
+	10 mesh	15.0	Nil
	25 mesh	27.9	1
	36 mesh	7.5	14
	44 mesh	4.3	23
	52 mesh	3.3	33
	60 mesh	1.7	37
	72 mesh	3.3	52
	85 mesh	2.9	65
	100 mesh	2.1	64
	120 mesh	3.2	73
	150 mesh	2.3	77
	200 mesh	2.9	70
+	300 mesh	4.1	77
+	30 microns	4.2	82
-	30 microns	15.3	Not Estimated
	Composite	100.0	22

It will be noted that the percentage of mica increases with decrease in size range. Due to practical difficulties, no attempt has been made to assess the minus 30 micron fraction. Excluding the minus 30 micron fraction, the estimated mica content of the sample was 22%.

#### Comparison of Some Flotation Reagents

*Preparation of Flotation Feed.* A sample of crude greisen was agitated with 0.5 lb./ton of tetrasodium pyrophosphate for 10 minutes. The plus 10 mesh material was removed by screening. The pulp was then thoroughly deslimed by decanting and washing through a 200 mesh screen.

The wet deslimed material was divided into 6 samples, and mica concentrate were obtained using various cationic collectors. Flotation feed was 20% solids.

*Flotation Procedure.* Flotation was carried out at a nominal pH of 2.5 (actual range 2.4-3.0) the low pH being maintained by stage additions of sulphuric acid as required. Acid consumption (average) was

Rougher flotation 3.2 lb./ton of rougher feed.

Cleaner flotation 0.7 lb./ton of rougher feed.

It is possible that acid consumption is related to the volume of pulp concerned, rather than to the quantity of solids present, and these consumption figures may be misleading if referred to commercial practice.

Frother aerofroth 73 was added to roughing and cleaner stages at the rate of 0.2 lb./ton of rougher flotation feed, but it is not known whether or not addition of a frother is necessary.

Cationic reagents were added at the rate of 0.10 or 0.15 lb./ton in stages, and it was noted that about half of the total reagent used was necessary to give sensible mica flotation. Under correct reagent conditions the mica flotation is rapid, and the end of useful flotation is readily seen.

Cationic Collector	Mica concentrate % weight of flot'n feed	Reagent Consumption lb./ton flot'n feed		Total
		Rougher	Cleaner	
Armac C	32.9	1.0	0.5	1.5
Arquad 12/50	33.0	2.1	0.6	2.7
Reagent 801	Nil	up to 5	.....	.....
Arquad S/50	33.6	2.1	0.9	3.0
Aeromine 3037	29.8	4.3	0.8	5.1
Armac HT	18.0	1.4	0.7	2.1

Of the above reagents, Armac C and Arquads 12/50 and S/50 gave similar results and on the basis of these tests these 3 reagents appear to be the most suitable. These 3 reagents are readily water soluble.

Aeromine 3037 is only with difficulty soluble in water and it was not possible to completely dissolve Armac HT in water as a 0.2% solution.

Mica concentrates obtained from Armac C and the Arquads were examined microscopically and appeared to contain plus 95% mica. The tailings contained very little mica—certainly less than 3 or 4%.

**Flotation Test with Three Stages of Cleaning**

A sample of crude greisen was agitated for 10 minutes with 0.55 lb./ton of tetrasodium pyrophosphate. The minus 30 micron slimes were decanted and the plus 10 mesh material removed by screening. The remainder of the sample was then floated at a pH of 2.5-2.9 using Armac C plus an occasional drop of Aerofroth 73. The rougher mica concentrate was cleaned 3 times under similar conditions.

Product	% Wght	Remarks & Estimated Mica Content from Microscopic Examination
+ 10 mesh	16.0	Coarse quartz: no recoverable mica.
— 30 $\mu$ slimes	19.0	Not examined.
Rougher tailing	36.2	Less than 1% free mica.
1st cleaner tailing	2.7	Mostly coarse quartz from cell slop; perhaps 2-3% mica.
2nd cleaner tailing	2.1	Mostly fine quartz; perhaps 3-5% mica.
3rd cleaner tailing	1.0	Mostly very fine quartz; perhaps 5-10% mica.
Mica conc.	23.0	Approximately 98% mica.

A sizing analysis of the mica concentrate gave—

Mesh	% Wght	Remarks
+ 60	1.2	Estimated 90% mica.
85	5.1	Estimated 95% mica.
100	3.0	Estimated 95-98% mica.
150	10.8	Estimated plus 98% mica.
200	8.1	Estimated plus 98% mica.
— 200	71.8	Not estimated.

Stage	Reagent Consumption		Lb./ton of Greisen	
	Sulphuric Acid	Armac C	Armac C	Aerofroth 73
Rougher	0.8	0.65	0.65	0.08
1st Cleaner	0.3	0.2	0.2	0.04
2nd Cleaner	0.3	0.2	0.2	0.04
3rd Cleaner	0.3	0.2	0.2	0.04
Total for rougher + 3 stages of cleaning	1.7	1.25	1.25	0.20

**Cost of Flotation Reagents**

On the basis of the above test a preliminary estimate of reagent costs can be made. This amounts to 13s. per ton of greisen or 56s. per ton of mica concentrate.

In a commercial continuous plant it is probable that these reagent costs would be substantially reduced particularly in the cleaning stages.

As mentioned previously it may not be necessary to add a frother although it was added during laboratory flotation tests.