SELECTIVE GRINDING OF FELDSPAR-MICA OVERSIZE
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Introduction

Grinding tests were carried out on an oversize feldspar-mica product which was obtained from a North Carolina feldspar producer. The object of these tests was to determine the best possible means of selectively grinding the feldspar to minus 35 mesh while grinding a minimum of mica present.

Sample Preparation

The 1,000 pounds of screen oversize as taken from the plant was coned and quartered, and representative 500-gram samples were cut out for grinding tests. Also a representative sample was cut out for screen analysis and determination of mica in the various screen fractions. This data is shown in Table 1.

Table 1

Mesh	% Wt	Cumul. Wt %	% (1) Mica	Mica Distr.	Cumul. Mica Distr.	% (2) Spar	Spar Distr.	Cumul. Spar Distr.
+14	1.0	1.0	87.3	9.5	9.5	12.7	0.1	0.1
-14+20	4.6	5.6	48.3	24.3	33.8	51.7	2.6	2.7
-20+28	26.3	31.9	13.6	39.2	73.0	86.4	25.0	27.7
-28+35	49.0	80.9	4.5	24.2	97.2	95.5	51.5	79.2
-35+48	15.4	96.3	1.3	2.2	99.4	98.7	16.7	95.9
-48+65	3.1	99.4	0.8	0.3	99.7	99.2	3.4	99.3
-65	0.6	100.0	4.1	0.3	100.0	95.9	0.7	100.0
Total	100.0		9.13	100.0		90.9		

(1) Mica content determined by vanning.

(2) The percent spar is not based on chemical analysis, but is that material remaining after the mica has been removed.

Grinding Tests

Grinding tests were carried out on the screen oversize using laboratory rod, pebble and ball mills. In each test, a five hundred gram sample was used. After each grinding test, a screen analysis, followed by mica determination (by vanning) in the plus 35 mesh screen fractions, was carried out on the ground material.

Rod Mill - The rod mill was operated at approximately 30 percent charge by volume for each test. Two sizes of rods were used, one inch and one-half inch, with a total weight of 13,245 grams. A series of tests was run in which the grinding time ranged from one minute to three minutes. The results of these tests are shown in Table 2.

Pebble Mill - The pebble mill was operated at approximately 30 percent charge by volume for each test. The total weight of the pebbles was 4,211 grams. A series of seven grinding tests was run in which the grinding time was varied from one minute to five minutes. The results of these tests are shown in Table 3.

Ball Mill - The ball mill was operated at approximately 30 percent charge by volume for each grinding test. The total weight of the balls was 5,469 grams. A series of five grinding tests was carried out using the ball mill and varying the time from one minute to three minutes. The results of these tests are shown in Table 4.

Results

The evaluation of the results of the grinding tests carried out on the screen oversize and shown in Tables 2, 3 and 4 of this report are as follows:

1. The plus 35 mesh of the head sample contained 97.2 percent of the mica, 79.2 percent of the feldspar and 80.9 percent of the total material.
2. The rod mill reduces the percent of total material in the plus 35 mesh fraction in a shorter period of time than either the ball or pebble mill.
3. The rod mill reduces more of the feldspar to minus 35 mesh in relation to the percent mica in the plus 35 mesh than either the ball or pebble mill. This relation is approximately the same for the pebble and ball mills.
4. In grinding to any stated size, the rod mill produces less fines than either the ball or pebble mill.
5. The rod mill produced a plus 35 mesh product that contained 84.0 percent of the total mica, 11.6 percent of the total spar and 18.2 percent of the total material. The grinding time for this test was 1.5 minutes.

   In order to remove 84 percent of the mica from ball-milled or pebble-milled material, it would be necessary to lose at least 37 percent of the total.

Conclusions

The conclusions drawn from the grinding tests as shown in Tables 2, 3 and 4 of this report are as follows:

(1) The rod mill shows greater selectivity in grinding of the feldspar than either the pebble or the ball mill.

(2) Considerably less grinding time is required for the rod mill than for either the pebble or ball mill.

Based on the grinding tests and those results obtained, it is indicated the rod mill produces the best results.

Table 2 - Rod Milling

	Grind Time (Min.)	Retained on 35 Mesh % of Mica	% of[1] Spar	% of Total Material	% -200 M
Head	0	97.2	79.2	80.9	-
Rod Mill	1.0	90.5[2]	21.1	25.8	9.0
" "	1.5	84.0	11.6	18.2	12.8
" "	2.0	77.4	9.3	15.5	13.6
" "	2.5	71.8	4.3	10.1	17.8
" "	3.0	60.3	2.1	7.3	21.8

[1]The percent spar is not based on chemical analysis, but is that material remaining after the mica has been removed.

[2]Due to experimental error, it was necessary to interpolate this figure (actual percent was 72.5 percent).

Table 3 - Pebble Milling

	Grind Time (Min.)	Retained on 35 Mesh % of Mica	% of[1] Spar	% of Total Material	% -200 M
Head	0	97.2	79.2	80.9	-
Pebble Mill	1.0	94.3	53.1	56.9	3.7
" "	1.5	91.0	39.6	44.3	5.7
" "	2.0	84.3	32.6	37.4	7.5
" "	2.5	80.4[2]	26.6	30.8	9.3
" "	3.0	77.0	21.5	26.6	11.0
" "	4.0	73.0[2]	14.5	21.7	14.6
" "	5.0	70.9	10.5	16.1	17.7

[1]The percent spar is not based on chemical analysis, but is that material remaining after the mica has been removed.

[2]These figures are theoretical and based on interpolation due to experimental error.

Table 4 - Ball Milling

	Grind Time (Min.)	Retained on 35 Mesh % of Mica	% of[1] Spar	% of Total Material	% -200 Mesh
Head	0	97.2	79.2	80.9	-
Ball Mill	1.0	91.1[2]	46.5	49.4	3.7
Ball Mill	1.5	85.0	40.5	44.3	5.5
Ball Mill	2.0	80.9	30.8	35.4	7.9
Ball Mill	2.5	72.2	24.9	29.2	8.8
Ball Mill	3.0	75.3	20.2	25.2	11.2

[1] The percent spar is not based on chemical analysis, but is that material remaining after the mica has been removed.

[2] Due to experimental error, it was necessary to interpolate this figure.