MICA LEACHING

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by
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Object

One of the objections to acid leaching of mica has been the high cost of acid consumption; this is true when the acid is used one time and then discarded. The object of this project was to determine the number of times acid could be re-used and still maintain its effectiveness, the amount of acid consumed per unit of mica, and the acid cost per ton of feed.

The ore for this project is a mica schist from near The Kings Mountain Mica Company's Patterson mine in Cleveland County and previously designated as Lab. No. 3023. The mica concentrate from this ore is identified as Lab. No. 3065.

Procedure

Flotation mica concentrate was split into eight representative 150-gram samples. Bulk density and color readings by Photovolt reflectance of the feed were determined. In each test 150 grams of mica concentrate was placed in a 600 ml. beaker into which was added ten percent H_2SO_4 to make up a pulp consistency of 25 percent solids. The beaker was placed on a controlled-temperature hot plate and the contents stirred continuously by a mechanical stirrer for one hour at 95-100°C. The beaker was removed and water added to bring solution back to its original volume. This also returned the solution to the original strength, because it was concentrated by evaporation of water during leaching. Also, less acid is lost with the filter cake when filtering a lower strength acid solution. The sample was then filtered on a Buchner filter using No. 4 filter paper, without adding wash water. The filtrate was weighed and the acid loss calculated. Iron analysis of the filtrate was obtained and used to calculate the total iron removal. Ten percent H_2SO_4 was then added to the filtrate in an amount that would bring the solution back to the original volume for use in the succeeding test. The filter cake was washed with water, the pH was neutralized by adding NaOH and the cake was then placed in an electric oven until dry. Bulk density and color readings by Photovolt reflectance meter were obtained on the sample and compared with colors before leaching.

Results

The data obtained indicates that the acid filtrate could be re-used indefinitely, after combining with fresh acid, without jeopardizing its leaching ability. (See color readings, Table 1). After six tests, the Fe_2O_3 in the filtrate became constant. In addition, the amount of iron leached out of the mica became balanced with the amount of iron remaining in the filter cake. The amount of iron in the filtrate at this stage was 14.6 percent, while the solubility of Fe_2SO_4 at 18°C is 26.4 percent. The amount of acid consumed was found to be 0.052 grams per gram of mica, which is equivalent to 104 pounds of acid per ton of mica. The acid cost for leaching mica was calculated to be about $1.04 per ton of mica concentrate. Various graphs of pertinent data are included in this report as Tables 2, 3 and 4.

Table 1

Head Feed Assay

93.5% mica
Total Fe_2O_3 = 9.00%
Fe_2O_3 leached by boiling 1-1 HCl solution 1 hour = 8.00%
Bulk density = 44.4
Color readings = G. - 40, A. - 42, B. - 31

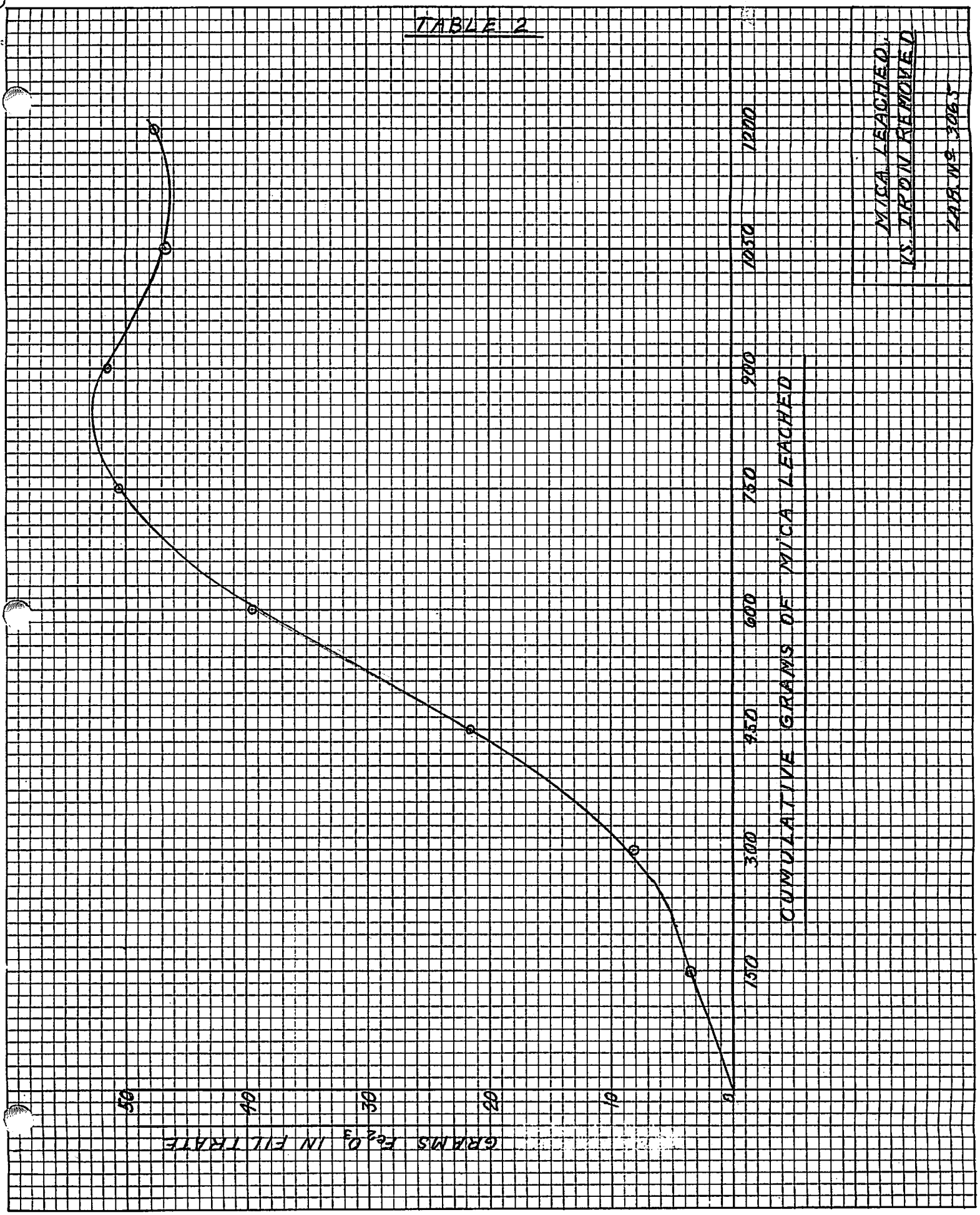
Test No.	Sol.Gms @ Start of Leach	Grams of Filtrate	Grams Fe_2O_3 in Filtrate	Acid Solution Added for Next Test		Conc. H_2SO_4 Added		Bulk Density lbs/cu.ft.	Colors After Leach		
				Grams Solution	Strength % Acid	Grams Added	Cum. Grams		Green	Amber	Blue
1	450.0	431.80	3.40					45.1	42	43	31
				20.30	34.0	6.90	6.90				
2	452.1	366.00	8.05					44.6	43	46	33
				84.00	5.0	4.20	11.10				
3	450.0	299.10	21.60					44.0	45	47	34
				157.30	15.0	23.60	34.70				
4	456.4	408.80	39.60					44.6	45	48	35
				41.20	10.0	4.12	38.82				
5	450.0	418.20	50.60					45.2	47	50	34
				31.80	10.0	3.18	42.00				
6	450.0	353.60	51.50					46.0	44	48	35
				96.40	10.0	9.64	51.64				
7	450.0	386.90	46.80					46.1	46	47	34
				63.10	10.0	6.31	57.95				
8	450.0	407.70	47.70					47.0	45	47	34
				42.30	10.0	4.23	62.18				

Grams of concentrated H_2SO_4 (66°Be) used per 1200 grams mica = 62.18
Grams of concentrated H_2SO_4 used per gram of mica = 0.052
Pounds H_2SO_4 per ton of mica = 104
Acid cost per ton of mica = 104 lbs x $0.01 = $1.04

Note: In the first four tests water was not added to the pulp before filtering and therefore it was necessary to add an acid solution of calculated strength and volume in order to return to original standards.

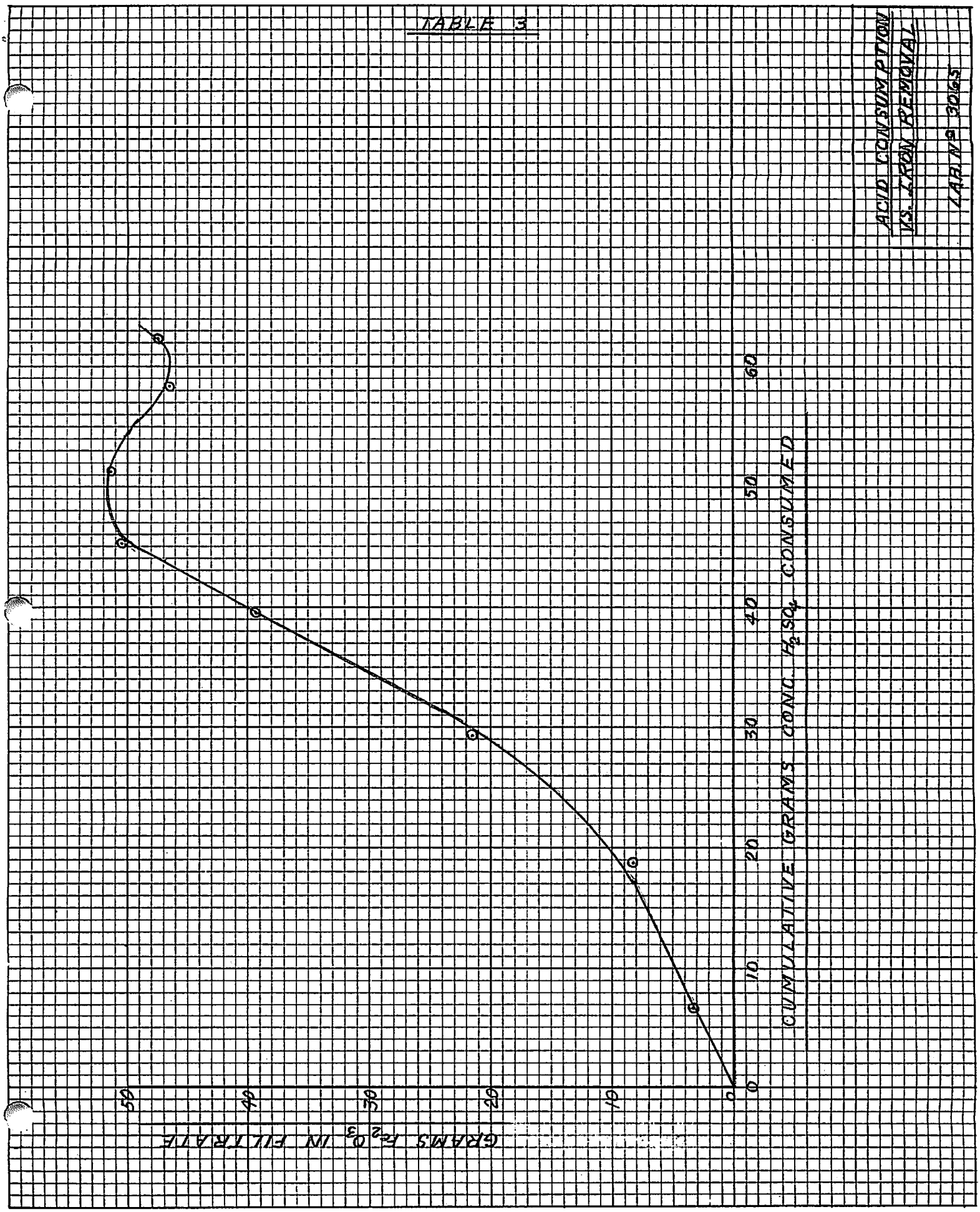
(15)

TABLE 2


MICA LEACHED,
VS. IRON REMOVED
LAB. NO. 3065
CUMULATIVE GRAMS OF MICA LEACHED
150
300
450
600
750
900
1050
1200
GRAMS Fe_2O_3 IN FIL TRATE
0
.01
.02
.03
.04
.05

(16)

TABLE 3


ACID CONSUMPTION
VS. IRON REMOVAL
LARVA 3065
GRAMS Fe_2O_3 IN FILTRATE
CUMULATIVE GRAMS COND H_2SO_4 CONSUMED
0
10
20
30
40
50
60
0
16
32
48
64

16-B

TABLE 4


ACID CONSUMPTION
VS. MICA LEACHED
Lab. No 3065
CUMULATIVE GRAMS OF MICA LEACHED
0
150
300
450
600
750
900
1050
1200
CUMULATIVE GRAMS CONC. H_2SO_4 CONSUMED
0
10
20
30
40
50
60