PRODUCTION OF CHROMITE TEST SAMPLE

Minerals Research Laboratory October 1970 Progress Report

Lab. No. 3603-B - Book 262

by
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Abstract

A sample of chromite, produced experimentally by Northwest Olivine Company, was concentrated on a shaking table at the Minerals Research Laboratory. A concentrate from this work was tested by Associated Metals and Minerals Corporation. Their test results are not available to us; however, they advised us that they would not be able to use this type material, at this time.

Objective

The object of this work was to produce a sample of chromite by gravity separation that could be tested for a commercial application.

Procedure

The sample used in this work was a rougher concentrate produced by Northwest Olivine Company at their Day Book deposit. The material was from a special run and was taken from spirals treating fine olivine (minus 35 plus 200 mesh). The screen analysis of this material, along with other data on the screen fractions, is shown in Table 1.

The equipment used in the laboratory work was a No. 13-A (18" x 40" deck) Denver-Wilfley concentrating table, right hand drive, serial number WE 890.

The sample as received was wet and was therefore dried overnight in a gas oven. After a short run to establish proper operating conditions,

the sample was concentrated. The flowsheet used is shown in Figure 1. Representative samples of each product were run on the Frantz Isodynamic Separator to determine chromite content. The results are shown in Table 2. On the basis of the information obtained with the Frantz, concentrates Nos. 1 and 2 were chemically analyzed. They were then combined and sent to Mr. Thomas S. Mackey, Associated Metals and Minerals Corporation, Texas City, Texas, 77590. Analyses and calculations from analyses are shown in Table 3.

Discussion

Microscopic examination of the screen fractions shows good liberation has taken place by crushing to minus 35 mesh. A chemical analysis of a concentrate made on the Frantz Isodynamic Separator showed a maximum possible grade of 54.8 percent Cr_2O_3. Other test work has shown that through strenuous cleaning and acid leaching, an ultimate analysis of 59.3 percent Cr_2O_3 is indicated. The tabling work is an indication of the type of product that might be produced by gravity separators.

The overall yield in this work was low. This was due more to the equipment than to the physical nature of the sample. Olivine has a specific gravity of 3.3 while this chromite has a specific gravity of 4.5. With good liberation and a difference in specific gravity of more than 1.0, gravity separation should be accomplishable with relative ease.

The riffles on the shaking table have warped and clean separations on unsized material are not as good as should be expected.

A 2,200 gram sample of chromite produced on the shaking table was sent off to be evaluated for consumer use. The company involved is

a mineral broker, and although they did not express an interest in the material at this time, it should not be assumed that the material will be unsuitable for other consumers. In fact, the broker has offered to have the product tested for foundry use, when sufficient material is made available. This information is being turned over to Northwest Olivine Company so that further arrangements can be made.

Conclusion

A sample of chromite was concentrated on a shaking table at the Minerals Research Laboratory.

This concentrate analyzed 53.26 percent Cr_2O_3, 19.94 percent FeO, and 3.60 percent SiO_2.

A product of similar characteristics could probably be produced in an operating plant with as good or better grade, and better yield.

The concentrate was evaluated by one company. Although they did not think they could use the material at this time, they have offered to try to interest others in its potential.

NORTH CAROLINA STATE MINERALS RESEARCH LABORATORY

Table 1

ORE DRESSING TEST DATA

Lab. No. 3603-B Test No. 1

Operator E. H. Bentzen III Date February 27, 1970

Object of Test Screen Analyses on Head Feed, Fine Fractions

			Chemical Analysis			Physical Analysis		
	Wt %	Cum.%	% Cr_2O_3	Unit	Dist.	Chrom	Unit	Dist.
Head	100.0	100.0	18.4			29.94		
+35 Mesh	1.46	1.46						
-35+48	6.28	7.74	17.9	1.39	6.88	27.60	2.14	6.75
-48+65	20.42	28.16	15.8	3.23	15.99	23.30	4.76	15.02
-65+100	30.50	58.66	17.1	5.22	25.84	26.38	8.05	25.40
-100+150	23.92	82.58	22.8	5.45	26.98	35.40	8.47	26.73
-150+200	9.94	92.52	28.4	2.82	13.96	46.02	4.57	14.42
-200	6.46	98.98	32.3	2.09	10.35	57.27	3.70	11.68
Losses	1.02	100.00						
Total	100.00	100.00		20.20	100.00		31.69	100.00

Conditions Reagents (lbs per ton)

Process	Time	% Solids	pH								

Remarks:

Screen 500-gr. on Ro-Tap for 20 minutes.

Physical Analysis on Frantz Isodynamic Separator.

Forward Slope = 10°

Side Slope = 20°

Amperes = 0.50

Figure 1

Material Flow in Tabling Process

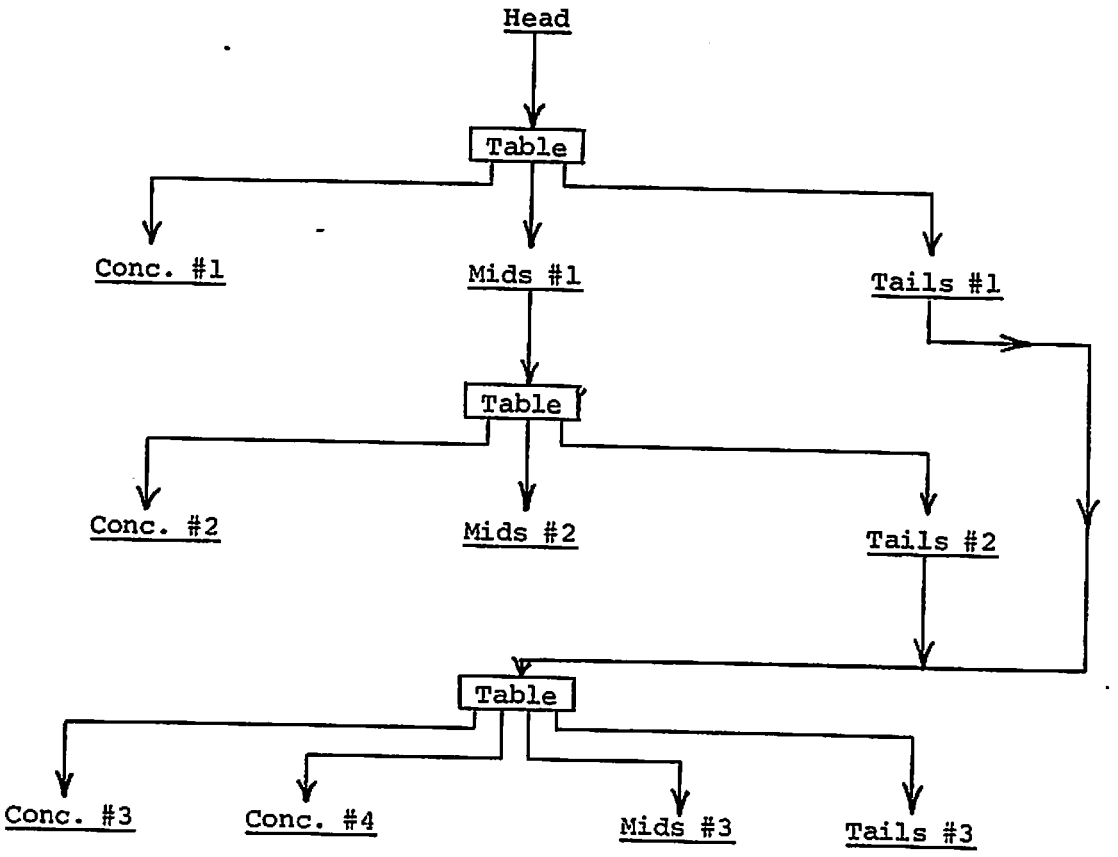

Table 2

Physical Analysis of Tabling Products

Product	Wt. Grams	% Chromite by Iso.	Wt. Chromite Grams
Concentrate #1	1402	93.0	1304
Concentrate #2	800	91.0	728
Concentrate #3	1408	74.6	1050
Concentrate #4	513	54.4	279
Middlings #1	6741	47.7	2013
Middlings #2	675	76.0	513
Middlings #3	2293	21.8	500
Tailings #1	7825	7.8	610
Tailings #2	5266	37.5	1975
Tailings #3	7795	5.4	421
Head:	14,886	30.13	4,795

Recovery: H = Calculated analysis of head = 30.1

C = Isodynamic analysis of concentrate = 93.0

T = Isodynamic analysis of tailings = 7.8

$$\frac{(H-T)C}{(C-T)H} \times 100 = \frac{(30.1-7.8)\ 93.0}{(93.0-7.8)\ 30.1} \times 100 = \frac{2074}{2565} \times 100 = 80.9\ \%$$

Yield: $\frac{2,202}{14,886} = 14.8\ \%$

Table 3

Calculations of Combined Concentrate Sent for Evaluation

	Cr_2O_3	FeO	SiO_2
Chemical Analysis			
Concentrate #1	54.2	20.2	3.2
Concentrate #2	51.6	19.5	4.3
Weight, Grams			
Concentrate #1	1402	1402	1402
Concentrate #2	800	800	800
	2202	2202	2202
% Weight			
Concentrate #1	63.67	63.67	63.67
Concentrate #2	36.33	36.33	36.33
	100.00	100.00	100.00
Units			
Concentrate #1	34.51	12.86	2.04
Concentrate #2	18.75	7.08	1.56
	53.26	19.94	3.60

Ratio Cr : Fe = 2.35 : 1