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GRAVITY CONCENTRATION OF A CHROMITE ORE FROM BOURRET EXPLORATIONS, THETFORD MINES, QUEBEC

by

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MINERAL PROCESSING DIVISION

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SUMMARY OF RESULTS

The shipment submitted was high grade lump ore assaying 47.00% Cr_2O_3 with a 2.9 to 1 Cr to Fe ratio. Gravity concentration of the ore at minus 28 mesh, using a Humphreys Spiral, produced a concentrate which assayed 52.0% Cr_2O_3, 2.7% SiO_2 and a combined Al_2O_3,MgO content of 27.6%. Ratio of Cr to Fe was 3.1 to 1 and recovery of Cr_2O_3 was 78.2%.

The concentrate although not meeting all market specifications is within a range to be acceptable by many users.

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INTRODUCTION

Bourret Explorations, Thetford Mines, P.Q., have obtained the rights to a chrome ore property located in Coleraine township, P.Q.

The property had been operated by Wartime Metals Corporation from 1942 to 1945, since which time the mine has remained closed with buildings and equipment dismantled and removed.

A previous investigation of ore samples from the property was made for Wartime Metals Corporation by the Department of Mines and Resources which was reported in Investigation No. 1068 dated August 1941. A recent investigation was also made by the Quebec Department of Mineral Resources for Bourret Explorations and reported in their Investigation No. 481 dated November 27, 1964.

Purpose of the Investigation

Mr. A. Bourret, Bourret Explorations Ltd., Thetford Mines, P.Q., requested in his letter of May 10, 1965, that we conduct an investigation for a commercial process which would produce chrome ore concentrates to meet market requirements. He suggested that Humphreys Spiral be tried in concentrating the ore.

Applicable specifications are summarized in the following Table.

TABLE 1

Typical Specifications for Ores and Concentrates*

Constituent	Metallurgical Grade	Refractory Grade	Chemical Grade
Cr_2O	Min 48.0%	Min 38.0%	Min 44.0%
Cr to Fe ratio	Min 2.8 to 1	Min 2.8 to 1	Min 1.6 to 1
SiO_2	Max 10.0%	Max 5.0%	Max 3.0%
Al_2O_3	Comb max	Min 12%	Max 15.0%
MgO	25.0%	Min 14%	-
Size	-3" Lump and Conc	Lump	Fines and Concentrates

*From Chromium, Vol. IV, Natural Resources Development Council of South Africa, June 1964.

Grades of Chrome Ore*

(a) Metallurgical, high chromium content and high chromium to iron ratio.

(b) Refractory, high alumina and low silica.

(c) Chemical, fairly high chromium and low silica.

Shipment

An 800 lb sample of -6 in. lump chrome ore was received at the Mines Branch on May 12, 1965.

The sample was submitted by Mr. A. Bourret and was said to be a composite of ore from different pits on the property.

Sampling and Analysis

The sample of -6 in. lump ore was crushed to -1/4 in. Approximately 100 lb was quartered out and crushed to -10 mesh. A head sample was riffled out for a chemical analysis.

TABLE 2

Results of Head Sample Analysis

Cr_2O_3	-	47.00 %
Fe	-	10.95 %
Cr to Fe ratio	-	2.9 to 1

DETAILS OF TESTS

Preliminary Laboratory Tabling Tests

Tests 1, 2,and 3

Two thousand gram samples of the -10 mesh ore were crushed to -20 mesh, -28 mesh,and -35 mesh respectively to determine the liberation characteristics of the ore.

Each sample was treated by a laboratory concentrating table with all the middling returned directly to the feed to obtain two table products, a final concentrate,and a tailing.

Results of the tabling tests are shown in Table 3.

TABLE 3

Results of Tabling at -20 mesh, -28 mesh,and -35 mesh

Product	Weight %	Analysis %			Ratio Cr to Fe	Distribution %
		Cr_2O_3	Cr	Fe		Cr_2O_3
Test 1. -20 mesh						
Concentrate	52.9	54.00	36.99	12.15	3.0 to 1	60.4
Tailing	47.1	39.85	27.30	9.90		39.6
Feed (calcd)	100.0	47.36	32.44	11.09		100.0
Test 2. - 28 mesh						
Concentrate	81.7	53.10	36.37	12.00	3.0 to 1	90.4
Tailing	18.3	25.30	17.33	7.50		9.6
Feed (calcd)	100.0	48.01	32.89	11.18		100.0
Test 3. - 35 mesh						
Concentrate	77.8	53.5	36.65	12.05	3.0 to 1	88.5
Tailing	22.2	24.4	18.08	7.80		11.5
Feed (calcd)	100.0	47.0	32.22	11.11		100.0

Test 4 - Humphreys Spiral Test at -28 mesh

A 400 lb sample of the ore was crushed to -28 mesh and concentrated by Humphreys Spiral at a rate of 1320 lb/hr. No provision was made to return the middling.

Results of a screen test on the Humphreys Spiral feed and concentrate are shown in Table 4 and the concentration test in Table 5.

TABLE 4

Results of Screen Tests

Mesh Tyler	Weight % Feed	Concentrate
- 28+ 35	14.0	19.1
- 35+ 48	17.9	23.5
- 48+ 65	18.7	20.6
- 65+100	15.1	16.2
-100+150	12.4	11.4
-150+200	5.4	4.0
-200	16.5	5.2
	100.0	100.0

TABLE 5

Results of Spiral Concentrating Test at -28 mesh

Product	Weight %	Analysis % Cr_2O_3	Cr	Fe	SiO_2	Al_2O_3	MgO	Ratio Cr:Fe	Combined Al_3O_3, MgO	Distribution % Cr_2O_3
Concentrate	72.3	51.91	35.56	11.45	2.73	12.03	15.58	3.1:1	27.61	78.2
Middling	12.1	47.56	32.58	11.01	6.00	11.01	17.45	3.0:1	28.46	12.0
Tailing	15.6	30.31	20.76	7.27	17.72	9.09	25.91		35.00	9.8
Feed (calcd)	100.0	48.01	32.89	11.64	5.26	11.45	17.42		28.87	100.0

CONCLUSIONS

The sample of -6 in. lump ore as submitted was sufficiently high grade without concentration to fall within the range commonly acceptable to many buyers.

Preliminary tabling tests indicated that crushing to -28 mesh resulted in sufficient liberation to allow production of concentrates of better grade with a good recovery of Cr_2O_3.

The Humphreys Spiral test produced a concentrate, with a Cr_2O_3 recovery of 78.2%, assaying 52.0% Cr_2O_3, 11.3% Fe, 2.7% SiO_2, and combined Al_2O_3, MgO content of 27.6%.

The concentrate met specifications for chemical grades. However, the combined Al_2O_3, MgO content was more than the 25.0% specified for metallurgical grades.

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