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PREPARATION OF IRON OXIDE AS PIGMENT

by

L. Bollen

to

SOUTH AUSTRALIAN GOVERNMENT
DEPARTMENT OF MINES

Investigated by: Metallurgy Section
Officer in Charge: P.K. Hosking

L. Wallace Coffer. Director

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES
Adelaide South Australia

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1. INTRODUCTION

Australia imports annually approximately 2000 tons of red iron oxide which is used as a pigment in the paint, rubber, linoleum and building industries.[1]

Previous laboratory testwork[2] on an iron ore from Malcolm Creek had shown that a hematite flotation concentrate could be produced relatively cheaply.

The purpose of this investigation was to produce approximately 2 hundredweight of hematite concentrate for evaluation by the paint industry. Specifications for the concentrate were:

a. an iron content of 65 per cent

b. a sizing similar to that produced previously in laboratory tests

2. SUMMARY

Pilot scale flotation equipment has been used to produce 376 pounds of hematite concentrate for evaluation by the paint industry as a red iron oxide pigment.

As requested, the material produced has a size distribution similar to that obtained in previous work.

The concentrate, assaying 62.8 per cent iron, was of lower grade than that requested. Owing to the small sample treated, the best flotation conditions were not obtained. With optimum conditions it is expected that a concentrate of 65 per cent iron could be produced.

The chemical properties of the iron oxide product conformed with American and English Standards for red iron oxide pigments. To conform to the Standards, the concentrate required further sizing reduction.

3. MATERIAL EXAMINED

Six bags of ore weighing 720 pounds were received. The ore sample contained a considerable quantity of fines. Large lumps of agglomerated fines which readily disintegrated when lightly crushed were also present.

The material appeared to be similar in physical appearance and grade to that treated previously.

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1. Commonwealth of Australia, Bureau of Mineral Resources, "The Australian Mineral Industry - 1962 Review".

2. BOLLEN, L., "Malcolm Creek Iron Ore Beneficiation Tests", AMDL Report 200, July, 1962.

4. EQUIPMENT USED

Jaw crusher:	8 x 6 in. Jaques[(a)]
Crushing rolls:	10 in. diam x 6 in. Star Machinery Company
Gyratory screen:	3 ft diam Boulton
Vibrating feeder:	3 in. Van Gelder
Rod mill:	1 ft diam x 2 ft
Attritor:	13 in. tank Wemco
Flotation cells:	No.8 Agitair

5. EXPERIMENTAL PROCEDURE AND RESULTS

The ore was crushed in a jaw crusher followed by reduction to minus 36 mesh using a rolls crusher and gyratory screen. The crushed material was then treated as shown in Figure 1.

The flotation reagents consisted of an emulsion of the following:

Component	Parts by Wt
Pamak 4	1.0
Fuel oil	2.0
Non-ion P100	0.1
Naphthenic acid	0.2
	3.3

This emulsion, diluted with water to produce a 10 per cent solution, was used at the rate of 4pounds per ton.

In the initial stage of the work reagents were added to the rod mill. Low recovery of iron resulted. The flotation reagents were then added to the attritor, which resulted in a marked increase in recovery.

(a) Reference to specific equipment in this report is made to facilitate understanding and does not imply endorsement of such equipment by The Australian Mineral Development Laboratories.

The dry weight of concentrate was 376 pounds. A sizing of the concentrate is shown in Table 1.

TABLE 1: SIZING OF FLOTATION CONCENTRATE

Screen Fraction BSS			Weight %
	+	100	0.6
- 100	+	150	3.6
- 150	+	200	4.1
- 200	+	300	8.0
- 300			83.7
			100.0

The chemical properties of the concentrate are shown in Table 2. For comparative purposes the chemical properties of Standard Specifications for iron oxide pigments are also given in Table 2.

TABLE 2: ANALYSIS OF PIGMENT

	Pigment Produced	Specifications	
		BS272:1952	ASTM, D84-51
	%	Type 1	Class 2 Type A
Total iron oxide, calculated as Fe_2O_3	89.7	50 (a)	70 (a)
Moisture and other volatile matter 98-102°C	0.04	1.0 (b)	2.0 (b)
Sulphur calculated as SO_3	< 0.005 (c)	- (d)	5.0 (b)
Matter soluble in water	0.012 (e)	1.0 (b)	2.0 (b)
Soluble chloride	0.005	0.1 (b)	- (d)
Total carbon	0.13	-	-
Calcium oxide	0.02	-	-
Loss on ignition	0.28	-	-

(a) Minimum
(b) Maximum
(c) < Less than
(d) Not applicable
(e) The acidity of the aqueous extract was equivalent to 0.05 ml N/10 acid per g.

6. DISCUSSION

No metallurgical data was requested from the pilot-scale treatment of the ore.

The general behaviour of the ore appeared to be similar to that previously reported. From visual examination of the flotation tailing, recovery of iron was high.

Flotation reagent consumption was higher than previously reported but optimum conditions could not be obtained with the small sample treated. The total reagent consumption was 4 pound per ton whereas previous results had shown that 2 pounds per ton was sufficient.

A sizing of the flotation concentrate (Table 1) showed that it was 83.7 per cent minus 300 mesh. The flotation concentrates reported in AMDL 200,[1] were not sized; however they would be finer than the flotation feed which was reported as 69.3 per cent minus 300 mesh.

The grade of the concentrate (62.8% iron) was lower than requested and was probably due to the increased usage of flotation reagents.

Comparison of the chemical properties of the concentrate (Table 2) with both British and American Standards indicated that the concentrate if ground to specification would be a satisfactory pigment for use in the paint industry.

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1. loc cit

FIGURE 1: FLOWSHEET