OTTAWA December 26th, 1940.

REPORT

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ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 938.

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Hematite Ore from the Belcher Islands, Quebec.

Analite from the Beleise Islands,

Shipment:

A 123-pound sample of hematite ore from the Belcher Islands, Quebec, was received on November 12th, 1940, from Mr. R. T. Gilman, President, Dominion Fluorspar Company Limited, Madoc, Ontario.

This sample was forwarded originally for 'Sink-and-Float' separation tests, the results of which were reported elsewhere.

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Sampling and Analysis:

The sample was crushed, cut and ground by standard methods to give a sample for analysis. This sample assayed:

Iron		43.36	per cent
Si02	-	29.10	
P205	-	0.05	
Sulphur	-	0.02	B
TiO2	-	0.03	

Characteristics of the Ore:

A megascopic examination of hand specimens of the ore shows two types of ore to be represented in the sample, as follows:

- A. Dull, fine-grained, compact looking, red hematite.
- B. Metallic, coarser-grained, steel grey, specular hematite.

Both varieties are hard and heavy but "B" is somewhat harder and heavier than "A".

Six polished sections, two from type "A" and four from type "B", were prepared and examined under the reflecting microscope for the purpose of determining the character of the ore.

Gangue -

elsowber's.

The gangue is highly siliceous, consisting largely of quartz in both types. A small amount of carbonate in small white patches is sporadically scattered through the sections from "B", but none was detected in those from "A". Most of the gangue is intimately associated with iron oxide, largely as a fine-grained admixture in which the two ingredients vary in all proportions, with

(Continued on next page)

ttons. t

- Page 3 -

(Characteristics of the Ore, cont'd) -

here gangue predominating and containing finely divided iron oxide, and there the latter mineral predominating and containing finely divided gangue. (See Figures 1 and 2). On the whole, gangue is more abundant in type "A" than in type "B".

Metallic Minerals -

Hematite is the preponderant metallic mineral. It appears to be finely crystalline and is often very finely divided, some of the smallest grains approaching the limit of resolution of the microscope (approximately 1 micron in size). In places the grains exhibit ragged, lacy edges which probably are the result of attack and replacement by quartz. As already noted, the hematite is somewhat coarser grained in "B" than in "A", but in polished sections the former variety is seen to enclose small local areas of the latter.

Magnetite in minor quantities is present in type "A" as irregular grains and subhedral crystals disseminated throughout the hematite gangue admixture. (See Figure 1). The grains average 40 microns (approximately 325 mesh) and enclose tiny inclusions of hematite and gangue.

The samples examined may be considered to be roughly representative of the ore submitted.

populant ites "Lis but mine wip detected in these from "A".

(Meridian Mine, cances Lo"Entituetely associated

A ... (Cantinged on north page)

(See Figures 1 and 2, on Pages 4 and 5.) (Characteristics of the tre, cont's)

hore grugue predeminating and containing sincing divided iron exide, and there the latter mineral predeminating and containing Minely divided, angue. (See Pigures 1 and 2). On therefold, gauged is more a which in type "A" than in type "A".

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Hematite is the proponderent motallie minoral. It appears to be finally crystalline and is often very finally divided, some of the smallest grains approaching the limit of resolution of the microscope (approximately i midron in size). In places the grains exhibit gagged, lacy edges which probably are the rotall of attack and replacement by quarts. As already noted, the hematite is somewhat coarser grained in "a" then in "A", but in polished softions the former veriety is seen to evelope small local areas of the

L'agnotite in clute (matilies is present in type "A" ce irregular grains and subhödrel crystals disseminated stincagient the komutive gengue administere. (See Figure 1). The grains average 40 storous (iproximately 325 mesh) and

Photomicrograph showing lean area from type "A" in which gangue predominates and contains finely divided hematite and a few disseminated grains of magnetite.

> Hematite - white; Magnetite (M) - white; Gangue - grey; and Pits - black.

> > (Soo Fightos-1 and 3.

on Pares 4 and B.)

Magnification - 200X.

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norriges .

Figure 2.

Photomicrograph of a richer area, type "B", showing coarser hematite containing finely divided gangue. Note also the very fine sizes of some of the iron oxide.

Level Time.

Hematite	white;
Gangue	 grey; and
Pits	 black.

Magnification - 200X.

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- Page 6 -

EXPERIMENTAL TESTS:

The set to want :

The test work consisted of gravity concentration, flotation, and reduction. Owing to the extremely fine grinding that was necessary only representative tests are shown.

Mirres 2.

Gravity Concentration.

Test No. 1

In this test, the ore at minus 14 mesh was ground in a ball mill to all pass through a 48-mesh screen. Grinding was at 66 per cent solids.

The pulp was passed over a laboratory-size Wilfley concentrating table.

Doonl	+	of	most	MO	7
Resul	. 65	OT	Test	NU.	1 2

REARCHER !! MINIST. and and there we are

Product	: Weight : Grams : : :	Per	: Assay, : Fe, :per cent	: Units	:Distribution, : per cent
Table conc. Table middling Table sands	: 259.8	15.03 37.96 12.35	38.11	864.83 1,793.61 470.66	19.25 39.91 10.47
Table slimes Totals	729.0 2,103.5	34.66	39.37 44.94 [®]	1,364.56	30.37

• Calculated. Ratio of concentration = 6.6:1.

	Screen A	Analysis, To		
	Mesh	: Weight, Middling	per cent : Slimes	
	+ 48		-	
	+ 65	: 0.40	-	
Tabout. A. T. an April d	+100	: 4.70	1 100 - 10° a	
北京省北京市 法 第四国民省金州		: 19.70	0.10	edolferes
and there is any the	and the second sec	: 22.80	0.10	al che a
	-200	: 52.40	99.80	
	nte Misba	100.00	100.00	1.

This test indicates that a fairly high-grade concentrate may be produced, but the recovery will be very low.

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Flotation Tests.

Test No. 2

In this test the ore at minus 14 mesh was ground in a ball mill until 47.2 per cent passed through 200 mesh. Grinding was at 66 per cent solids.

revit/ concen-

Reagents to the mill were 2.5 pounds per ton sodium silicate.

The pulp was transferred to a 2,000-gram flotation cell and floated at 20 per cent solids. Reagents to flotation were 5.6 pounds per ton cleic acid and 0.075 pound per ton of pine cil.

The rougher concentrate was cleaned with 0.3 pound sodium silicate per ton.

Product	and a company second period of the	Per :	Assay, Fe, per cent	: Units :	Distribution, per cent
Flot. conc.	781.5	38.80	46.83	1,817.00	42.48
Flot. middling	: 426.5	21.18	42.00	889.56	20.79
Flot. tailing	: 806.0	40.02	39.27	1,571.58	36.73

Calculated. Ratio of concentration = 2.6:1.

Mesh :	Weight, per cent
+ 48151 :	: 4.70 : 10.70
+ 65 + 100 :	0.60 0.10
+150 :	25.70
-200 :	47.20

concentrate may be produced, but the recovery will be

verm low.

(Flotation Tests, cont'd) -

Test No. 3.

In this test the ore at minus 14 mesh was ground in a ball mill to pass 47 per cent through 200 mesh. Grinding was at 66 per cent solids. No reagents were fed to the ball mill.

The ground pulp was transferred to a 2,000-gram flotation cell and floated at 20 per cent solids. Reagents

to the flotation cell were: tion cell and floated at 20 per cent solids. Reagents to <u>Lb./ton</u>

flotation were 5.6 pounds per ton alois heid and 0.075 Concentrated hydrochloric

noun	d par to acid nino	012.		11.0		
1	Sodium oleate			1.1		
	Oleic acid	conc untr	10	- 0.175 and	with 0	1
	Pine oil	- + -	+	0.05		1

round sodium cllicate per ton. The sodium oleate and oleic acid were added

in stages but although they produced a voluminous frothibution, only a small amount of mineral was floated.

.3

Flot. come The pH of the flotation pulp was 3.7.0 42.48

	: Weigh	t :	Assay,	:	:Distribution,
TetrProduct	Grams	and the second	Fe, per cent	: Units 4	per cent
Flot. conc. Flot. tailing	404.0 1,635.5	19.81 80.19	45.36 42.84	898.58 3,435.34	20.73 79.27
Totals	:2,039.5	100.00	43.34	4,333.92	100.00

^e Calculated. Ratio of concentration = 5:1.

This test showed that flotation in an acid pulp, as recommended by some authorities, is not applicable to this ore. (Flotation Pests, contid) -

W Kananas

La Hall Charles

Product

Reduction Tests.

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Test No. 4

In this tert minus 14 mech was ground A sample of the ore was dry-ground 87 per Grind-200 Mesh. cent minus 200 mesh and reduced with gas at a temperature of 450° C. to form magnetite. Analysis of the

product showed reduction to be 91 per cent complete.

A small sample of the magnetized product flotation d was treated in a Davis tube magnetic concentrator to see if any worthwhile separation of the iron from the gangue

could be effected. The concentrate was retreated in the

tube to shake out as much of the gangue as possible.

This treatment failed to produce a high-grade

iron product owing to the intimate association of the the socher olesie idia wore added gangue and the iron oxide as shown by the microscopic stagen but although they produced a voluminous froth examination and the accompanying photomicrographs. only a small amount of internal was florted

The magnetic concentrate assayed 48.4 per the pH of the flotation alp the S. cent iron and contained 27.74 per cent of acid insoluble.

: Selgit : Asei . : : Cramp : . er : Po, : 7 91 1 1 1 10 Distribution,

er : Pe, : Units por cent Mat. conc. : 404.0 10.01 48.05 892.581 20.73 Summary and Conclusions: (0.19 42.04 0,450.04 78.27

Totala This particular iron ore does not appear to be 00 amenable to any of the more common methods of concentration. The close association between the hematite and the silica present in the ore would make it necessary to grind this ore much finer than was done in tophic these tests before the iron mineral was free. However,

(Concluded on next page)

(Summary and Conclusions, cont'd) -

grinding to such fine sizes is expensive, and then the problem arises of handling any concentrates that may be produced. It would be necessary to sinter these concentrates, which again is an expensive treatment.

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This ore does not seem to be suitable for commercial recovery of the iron. If any worldmidle compation of the iron from the category could be chilested. The concentrate are self-solid in the same is sinkered as included to provide a high-spade from product oning to be initiate association of the pargue and the iron onio (000000000), the ideocoopie amazingtion and the concentration is concerned. The registic constrained accepted a definition. The registic constrained accepted a definition.

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