

M. M. Farnham 630.3

O T T A W A March 17th, 1943.

R E P O R T
of the
ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1371.

Magnetic and Table Concentration Tests on
Ilmenite Ore from the Simack Syndicate,
Lake Allard Area, Northern Quebec.

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Lake Allard Area, Northern Quebec.

Shipments:

Two boxes of ilmenite ore, net weight 250 pounds, were received on February 12th, 1948. This shipment was consigned to the Department by Mr. R. P. Mills, 215 St. James Street West, Montreal, Quebec, on behalf of the Simack Syndicate.

Location of the Property:

The property of the Simack Syndicate from which the present shipment was obtained is situated near Lake Allard, in the lower Romaine River valley, northern Quebec.

Sampling and Analysis:

After crushing, cutting and grinding by standard methods, a representative sample of the shipment was obtained which assayed as follows:

	<u>Per cent</u>
TiO ₂	35.93
Iron	44.00
Vanadium	0.18
Manganese	0.17
SiO ₂	0.44
Al ₂ O ₃	0.50
CaO	None detected.
MgO	2.80
Sulphur	0.06

Characteristics of the Ore:

Four polished sections were prepared and examined microscopically for the purpose of determining the character of the ore.

Gangue -

The gangue, which forms a very minor portion of the polished surfaces, varies in character and consists of small patches and irregular grains of hard and soft materials scattered sporadically through the ilmenite. The appearance of the hard component under crossed nicols suggests a plagioclase feldspar.

Metallic Minerals -

Ilmenite, the most abundant mineral in the polished sections, occurs as coarsely granular masses which form the matrix in which the other minerals are embedded.

Hematite is abundantly visible in ilmenite as tiny needles and coarse to very fine irregular blebs which are probably due to exsolution. The needles are more prevalent in the polished sections and from their parallelism are apparently following a crystallographic direction in the host mineral. Where the hematite occurs as irregular bodies,

(Characteristics of the Ore, cont'd) -

however, they are scattered more or less at random through the ilmenite. Some of the hematite, in turn, contains unmixed ilmenite. In general the irregular blebs of hematite contain more ilmenite than do the needles. (See the photomicrographs, Figures 1 and 2, which depict approximately average fields).

Pyrite is present in ilmenite and gangue as occasional, coarse to fine irregular grains, but the total quantity is small. Rare small grains of chalcopyrite, usually associated with pyrite, are visible in the same manner.

Conclusions from Microscopic Examination -

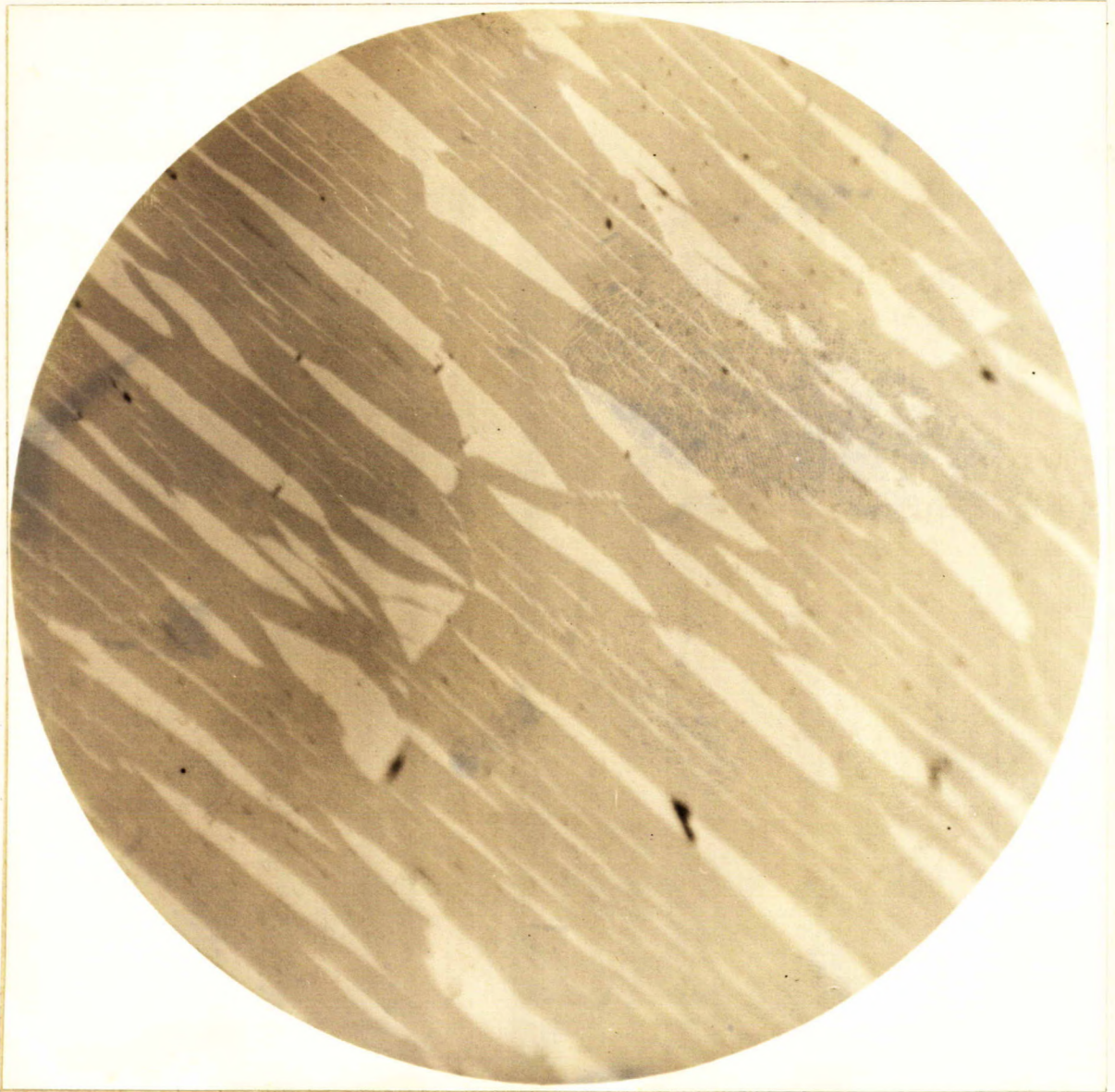
A microscopic examination of four polished sections and a megascopic inspection of two hand specimens of this ore sample indicate the following:

1. Ilmenite is abundant but contains up to probably 25 per cent by volume of hematite as unmixed intergrown bodies most of which are too small to be economically separated by grinding.
2. While no magnetite was identified in the polished surfaces, a few small particles of powdered material from a hand sample clung to a small bar magnet when touched by it. Hence, if magnetite is present it is only in very small amount.
3. Sulphides and gangue material are present in relatively small quantities.

(Figures 1 and 2 follow on)
(Pages 4 and 5.)
(Text continues on Page 6.)

(Characteristics of the Ore, cont'd) -

Figure 1.



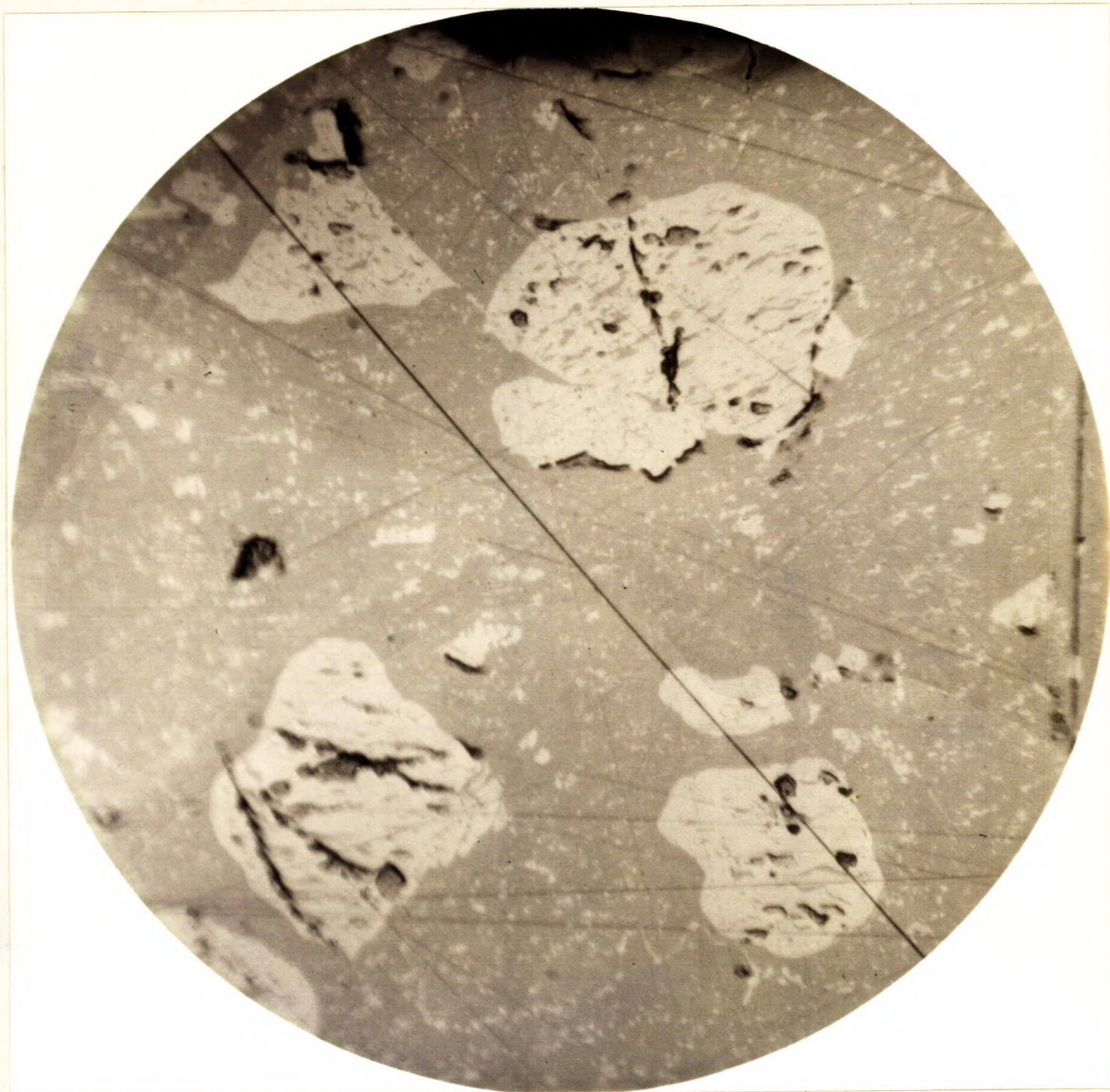
Photomicrograph of polished section showing tiny needles of hematite in ilmenite. Note the parallel arrangement of the hematite and that it contains little, if any, unmixed ilmenite.

Ilmenite	-	grey.
Hematite	-	white.
Pits	-	black.

Magnification - X200.

(Characteristics of the Ore, cont'd) -

Figure 2.



Photomicrograph of polished surface showing irregular bodies of hematite in ilmenite. The former show no particular arrangement in the latter and contain tiny inclusions of unmixed ilmenite.

Ilmenite	-	grey.
Hematite	-	white.
Pits and scratches	-	black.
Magnification	-	X200.

Investigative Work:

The test work on the ore shipment consisted of magnetic and table concentrations of the finely crushed material. Magnetic concentration in the Davis tube gave a magnetic concentrate assaying 70.9 per cent iron and 11.8 per cent TiO_2 on a portion of the ore sample crushed to minus 200 mesh. However, only 2 per cent of the ore reported in the magnetic concentrate.

Other portions of the ore were crushed and passed through the Ball-Norton magnetic machine, with results that did not show any beneficiation. The non-magnetic tailing from this machine was then concentrated on a Wilfley table with results that still showed no particular separation of the iron and titanium in the ore.

Details of Tests:

Test No. 1 (A, B, and C). - Magnetic Concentration by the Davis Tube Magnetic Separator.

This machine is designed to operate satisfactorily on ore containing strongly magnetic material when this ore is crushed to minus 100 mesh. It is essentially a laboratory "wet" method of magnetic concentration which will give results indicating the suitability of applying magnetic concentration to this type of ore.

Three lots of ore were taken. Lot A was crushed to minus 100 mesh; Lot B to minus 150 mesh, and Lot C to minus 200 mesh. The lots were then concentrated in the Davis tube, with the following results:

(Continued on next page)

(Test No. 1, cont'd) -

Test No. 1-A (Minus 100 mesh).						
Product	Weight, per cent	Assays,		Distribution,		Ratio of concen- tration
		TiO ₂ per cent	Fe per cent	TiO ₂ per cent	Fe per cent	
Feed	:100.00	: 35.35 [Ⓞ]	: 43.52 [Ⓞ]	: 100.00	: 100.00	:
Magnetic conc.	: 2.14	: 15.50	: 66.15	: 0.94	: 3.25	: 47:1.
Tailing	: 97.86	: 35.78	: 43.02	: 99.06	: 96.75	:

Test No. 1-B (Minus 150 mesh).						
Product	Weight, per cent	Assays,		Distribution,		Ratio of concen- tration
		TiO ₂ per cent	Fe per cent	TiO ₂ per cent	Fe per cent	
Feed	:100.00	: 35.32 [Ⓞ]	: 43.91 [Ⓞ]	: 100.00	: 100.00	:
Magnetic conc.	: 2.05	: 13.57	: 69.42	: 0.79	: 3.24	: 49:1.
Tailing	: 97.95	: 35.78	: 43.38	: 99.21	: 96.76	:

Test No. 1-C (Minus 200 mesh).						
Product	Weight, per cent	Assays,		Distribution,		Ratio of concen- tration
		TiO ₂ per cent	Fe per cent	TiO ₂ per cent	Fe per cent	
Feed	:100.00	: 35.63 [Ⓞ]	: 44.34	: 100.00	: 100.00	:
Magnetic conc.	: 2.01	: 11.78	: 70.88	: 0.67	: 3.21	: 50:1.
Tailing	: 97.99	: 36.12	: 43.80	: 99.33	: 96.79	:

Ⓞ Calculated.

Test No. 2 (A, B, and C). - Magnetic Concentration by the Ball-Norton Magnetic Separator. Table Concentration of Non-Magnetic Tailing.

In this test, portions of the ore were ground dry to minus 35 mesh (A), minus 48 mesh (B), and minus 65 mesh (C). The pulps were then passed through the Ball-Norton magnetic separator. The magnetic concentrate was assayed for iron and the non-magnetic tailing was concentrated on a Wilfley sand table.

Magnetic Concentration:

Test No. 2-A (Minus 35 mesh).					
Product	Weight, per cent	Fe		Distribution of Fe, per cent	Ratio of concen- tration
		assay, per cent	per cent		
Feed	: 100.00	: 43.00 [Ⓞ]	:	: 100.00	:
Magnetic conc.	: 1.60	: 47.30	:	: 1.76	: 63:1.
Tailing	: 98.40	: 42.93	:	: 98.24	:

Ⓞ Calculated.

(Continued on next page)

(Test No. 2, cont'd) -

Test No. 2-B (Minus 48 mesh).					
Product	Weight, per cent	Fe assay, per cent	Distribution, per cent	Ratio of concentration	
Feed	100.00	42.99 [Ⓢ]	100.00		
Magnetic conc.	1.34	47.74	1.49	75:1.	
Tailing	98.66	42.93	98.51		

Test No. 2-C (Minus 65 mesh).					
Product	Weight, per cent	Fe assay, per cent	Distribution, per cent	Ratio of concentration	
Feed	100.00	43.00 [Ⓢ]	100.00		
Magnetic conc.	1.26	48.58	1.42	79:1.	
Tailing	98.74	42.93	98.58		

Ⓢ Calculated.

Wilfley Table Concentration of Non-Magnetic Tailing:

Test No. 2-A (Minus 35 mesh).						
Product	Weight, per cent	Assays, per cent		Distribution, per cent		Ratio of concentration
		TiO ₂	Fe	TiO ₂	Fe	
Feed	100.00	35.46 [Ⓢ]	43.02 [Ⓢ]	100.0	100.0	
Table conc.	67.00	36.04	43.57	68.1	67.9	1.49:1.
" middling	23.76	34.88	42.49	23.4	23.5	
Final tailing	9.24	32.78	40.39	8.5	8.6	

Test No. 2-B (Minus 48 mesh).						
Product	Weight, per cent	Assays, per cent		Distribution, per cent		Ratio of concentration
		TiO ₂	Fe	TiO ₂	Fe	
Feed	100.00	36.94 [Ⓢ]	42.98 [Ⓢ]	100.0	100.0	
Table conc.	44.57	37.43	44.06	45.2	45.7	2.24:1.
" middling	33.39	36.97	42.75	33.4	33.2	
Final tailing	22.04	35.92	41.17	21.4	21.1	

Test No. 2-C (Minus 65 mesh).						
Product	Weight, per cent	Assays, per cent		Distribution, per cent		Ratio of concentration
		TiO ₂	Fe	TiO ₂	Fe	
Feed	100.00	36.02 [Ⓢ]	42.42 [Ⓢ]	100.0	100.0	
Table conc.	32.36	37.20	43.27	33.4	33.0	3.09:1.
" middling	39.79	36.85	43.53	40.7	40.8	
Final tailing	27.85	33.48	39.86	25.9	26.2	

Ⓢ Calculated.

SUMMARY AND CONCLUSIONS:

The small-scale test work on the shipment shows that neither magnetic concentration nor table concentration results in any marked beneficiation. In the magnetic concentration of Test No. 1 only 2 per cent of the ore reported in the magnetic concentrate, this 2 per cent assaying 71 per cent Fe and 12 per cent TiO₂ and indicating about 1.5 per cent free magnetite at a grind of minus 200 mesh.

In the table concentration, in Test No. 2 practically no separation of the iron and titanium was obtained, and, as only 2 or 3 per cent of the shipment was gangue material, it was not found possible to increase the amount of ilmenite in the concentrate to any great extent.

The microscopic work on the polished sections disclosed the fact that the ilmenite contains numerous needles and blebs of hematite which are too small to be economically separated by grinding. This is well illustrated in the photomicrographs.

From the above summary of the test work, it is apparent that beneficiation by means of ore dressing methods is not applicable to this ore shipment.

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