

O T T A W A

June 18th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1430.

Microscopic and Chemical Examination of Sphalerite
from the Berens River Mines Limited,
Favourable Lake, Ontario.



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Sample:

On May 29th, 1943, a small sample of sphalerite, designated as "Sample A", was received from the Berens River Mines Limited, Favourable Lake, Ontario, per Mr. W. R. Sutton, Geologist. This sample represented carefully hand-picked material.

Purpose of Investigation:

Mr. Sutton requested that the iron content of the sphalerite be determined, if possible, in order to determine the ultimate grade of zinc concentrate which it would be theoretically possible to make.

Microscopic Examination of Sphalerite:

Microscopic examination of polished sections of the sphalerite shows that it is coarsely crystalline and that it is deep red in colour in transmitted light; this colour indicates the presence of considerable iron. It is free from the tiny blebs and rods of chalcopyrite which are present in many sphalerites. Associated with the mineral as irregular patches and grains are chalcopyrite, galena, and pyrite.

A portion of Sample A was ground through 65 mesh and a sample of as pure sphalerite as possible was picked from this product under the binocular microscope. A polished section was prepared from this material and the remainder was sent to the Chemical Laboratory for determination of as many elements as possible on the small amount of material. The minerals were determined quantitatively under the microscope, as follows:

	<u>Per cent</u> by <u>volume</u>	<u>Approximate</u> per cent by <u>weight</u>
Sphalerite	- 98.9	98.45
Pyrite	- 0.95	1.4
Galena	- 0.1	0.1
Chalcopyrite	- 0.05	0.05
Gangue materials not determined.		
not determined	-	-
	<hr/> 100.00	<hr/> 100.00

Chemical analysis of the same sample gives the following:

	<u>Per cent</u>
Zinc	- 57.98
Iron	- 7.64
Al ₂ O ₃	- 0.36

Composition of the Sphalerite:

On the basis of the information above, the percentages of the various minerals were calculated as follows:

	<u>Per cent</u>
Sphalerite	97.52
Pyrite	1.40
Galena	0.10
Chalcopyrite	0.05
Gangue (including 0.36 per cent Al ₂ O ₃)	0.93
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Total -----	100.00

It was calculated that the sphalerite consists of 86.54 per cent as ZnS and 10.98 per cent as FeS. The calculated composition of the pure sphalerite would therefore be as follows:

	<u>Per cent</u>
Zinc	59.5
Sulphur	33.4
Iron	7.1
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Total	100.0

CONCLUSION:

On the basis of microscopic and chemical investigation of the sample of sphalerite, it is calculated that the iron content is approximately 7.1 per cent. This does not take into consideration any iron which might be present in the gangue, but since only 0.93 per cent is available for gangue and 0.36 per cent of this is Al₂O₃ and most of the remainder probably silica, there must be only a very small quantity of

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(Conclusion, cont'd) . =

iron in the gangue.

While on the basis of this work it is theoretically possible to obtain a 59.5 per cent zinc concentrate, it would nevertheless be impossible to achieve this in practice. It must also be remembered that it is possible that the composition of the sphalerite itself may be somewhat variable through a deposit.

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MHH:GHB.

(Test No. 4, cont'd) -

Product	Weight, per cent	Assays, per cent			Distribution, per cent		
		Fe	Ni	Cr ₂ O ₃	Fe	Ni	Cr ₂ O ₃
Magnetic conc.	82.76	59.40	0.58	1.73	95.54	96.70	32.4
Non-mag. tailing	17.04	13.52	0.096	17.50	4.46	3.30	67.5
Table conc. (cal.)	100.00	51.71	0.50	4.41	100.00	100.00	100.0

Ratio of concentration after magnetic
concentration of table concentrate = 23.6:1.

Metal recoveries in magnetic concentrate, expressed
in terms of the original feed content, are:

Iron - 95.54 x 38.4 = 36.69 per cent.
Nickel - 96.70 x 13.6 = 13.15 "
Chromic oxide - 32.44 x 48.4 = 15.70 "

The following table gives a comparison of results
obtained by magnetic and table concentration, both operating
on deslimed feed:

Method	Tons of concentrate:		Assays,			Distribution,		
	from 100 tons of original feed		per cent			per cent total		
	Iron con- centrate	Chromium conc.	Fe	Ni	Cr ₂ O ₃	Fe	Ni	Cr ₂ O ₃
Magnetic concentration	2.76	-	50.29	0.62	1.36	23.42	9.21	4.84
Table concen- tration fol- lowed by mag. concentration	4.23	-	59.70	0.58	1.73	36.69	13.15	15.70
"	-	0.87	13.52	0.096	17.50	1.71	0.45	32.70