

O T T A W A

July 14th, 1941.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1049.

Flotation Concentration of Copper-Lead-Zinc-Silver
Ore from the Shefford Gold Mines Company Limited,
Lake Megantic, Frontenac County, Quebec.

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Shipment:

A bag of ore, weighing 117 pounds, was received on May 20th, 1941, from the Shefford Gold Mines Company Limited, Lake Megantic, Frontenac county, Quebec. The shipment was submitted by W. A. Marois, Box 153, 105A Laval Street, Lake Megantic, Quebec.

Sample:

The sample was taken from a vein on Lot No. 10, Range 6, in the township of Ditchfield, Frontenac county, Quebec.

Characteristics of the Ore:

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

Gangue -

The gangue is composed of slightly fractured white quartz, which bears a few local, light-brown stains of iron oxides, and encloses narrow streaks and small patches of dark greenish-grey material; the latter probably represent remnants of country rock.

Metallic Minerals -

Metallic mineralization is moderately abundant and consists of a rather coarse-grained admixture of pyrite, chalcopyrite, galena and sphalerite in which pyrite preponderates as disseminated grains with the other sulphides to a large extent filling the interstices between them. In places the iron sulphide is fractured and the fractures filled with gangue, more rarely with galena and chalcopyrite. It also contains numerous inclusions of gangue and occasional small grains of the other sulphides.

Chalcopyrite, galena, and sphalerite occur in gangue as small irregular masses and disseminated grains, which, as already mentioned, are frequently interstitial to grains of pyrite. These three sulphides are often intimately associated and each encloses inclusions of the others. Those of chalcopyrite in sphalerite usually take the form of tiny

(Characteristics of the Ore, cont'd) -

The sample was taken from a vein on Lot No. 10, dots which are scattered at random in some places and arranged in rows in other places. Although each mineral is locally abundant, its total quantity is relatively small.

Sampling and Assaying:

After crushing and grinding to minus 14 mesh, a sample for assay was cut by the standard method. The sample assayed as follows:

<u>Gangue</u>	
Gold	- 0.01 ounce per ton of ore.
Silver	- 0.41 "slightly fractured"
Copper	- 0.50 per cent.
Lead	- 0.36 "light-brown stains"
Zinc	- 0.30 "

white quartz, which is a few light-brown stains of iron oxides, and encloses narrow streaks and small patches of dark greenish-grey.

EXPERIMENTAL TESTS.

The gold and silver values in the ore received were respectively 0.01 and 0.41 ounce per ton of ore. The recovery of these metals by amalgamation on an ore as low as this would not be economical.

The test work consisted of flotation concentrations. A bulk concentrate was obtained which assayed as follows: silver, 1.78 ounces per ton; copper, 3.09 per cent; lead, 1.48 per cent; zinc, 2.94 per cent. The per cent recoveries were: silver, 72.9; copper, 93.1; lead, 81.3; zinc, 87.4.

(Test No. 1). In Test No. 2, a selective flotation was made. A copper-lead concentrate was obtained which assayed 6.80 ounces of silver per ton; 14.55 per cent copper, 8.06 per cent lead and 5.61 per cent zinc. The Cu-Pb concentrate contained 45.7 per cent of the silver, 75.2 per cent of the copper and 77.5 per cent of the lead in the ore. The copper-lead ratio of concentration was 36.4 into 1. The zinc concentrate obtained assayed 19.0 per cent zinc, 3.98 per

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(Characteristics of the Ore) -
 (Experimental Tests, cont'd) -

cent copper and 0.42 per cent lead. The zinc concentrate contained 54.7 per cent of the zinc in the ore. The ratio of concentration was 66.7 into 1.

Details of the tests follow:

Test No. 1. - Bulk Flotation.

A sample of minus 14 mesh product was ground to 86 per cent minus 200 mesh with 2.0 pounds of soda ash and 0.10 pound of Aerofloat No. 25 per ton of ore. The pulp was transferred to a flotation cell and 1.0 pound of copper sulphate per ton of ore was added and conditioned 5 minutes. Then 0.15 pound of Reagent 301 and 0.12 pound of pine oil per ton of ore were added and the froth skimmed off for 10 minutes.

The concentrate was cleaned by refloating. No additional reagents were used.

Results of Bulk Flotation.

Product	:Weight, : per : cent	A s s a y s					Distribution, per cent				
		: oz./ton : Au	: Ag	: Cu	: Pb	: Zn	: Au	: Ag	: Cu	: Pb	: Zn
Feed	: 100.00	: 0.009	: 0.39	: 0.53	: 0.29	: 0.54	: 100.0	: 100.0	: 100.0	: 100.0	: 100.0
Conc.	: 16.12	: 0.03	: 1.78	: 3.09	: 1.48	: 2.94	: 51.3	: 72.9	: 93.1	: 81.3	: 87.4
Cleaner tailing:	: 2.59	: 0.02	: 1.62	: 1.11	: 0.87	: 0.76	: 5.5	: 10.6	: 5.4	: 7.7	: 3.6
Tailing	: 81.29	: 0.005	: 0.08	: 0.01	: 0.04	: 0.06	: 43.2	: 16.5	: 1.5	: 11.0	: 9.0

Ratio of concentration = 6.2:1.

pH of flotation tailing solution = 7.7.

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(Experimental Tests, cont'd) -

Test No. 2. - Selective Flotation.

In this test a sample of ore was ground to 86 per cent minus 200 mesh with the following reagents:

Details of the reagents used:		<u>Lb./ton of ore</u>
Soda ash	-	4.0
Sodium cyanide	-	0.15
Zinc sulphate	-	0.30
Aerofloat No. 25	-	0.10

The pulp was transferred to a flotation cell and copper and lead minerals were floated for 5 minutes. Then the pulp was conditioned for 10 minutes with 7.0 pounds of lime per ton. The sphalerite was floated by adding 0.20 pound of copper sulphate and 0.02 pound of Aerofloat No. 213 per ton of ore. The copper-lead concentrate was cleaned by refloating. No additional reagents were used.

Results of Selective Flotation.

Product	Weight, per cent	A s s a y s					Distribution, per cent			
		Oz./ton	Per cent	Per cent	Per cent	Per cent	Ag	Cu	Pb	Zn
Feed	100.00	0.41	0.53	0.29	0.52	100.0	100.0	100.0	100.0	
Cu-Pb conc.	2.75	0.03	6.80	14.55	8.06	5.61	45.7	75.2	77.5	29.7
Cu-Pb cleaner	0.00	0.00	0.00	0.00	0.00	0.00	100.0	100.0	100.0	100.0
Cu tailing	0.55	3.90*	2.77	1.84	2.69	19.5	2.9	3.5	2.8	
Zn conc.	1.50	3.98	0.42	19.00	10.0	11.2	2.3	54.7		
Tailing	95.20	0.005	0.15	0.06	0.05	0.07	34.8	10.7	16.7	12.8

* Calculated value.

Ratio of concentration = 6.8:1.
 pH of the Cu-Pb flotation solution = 9.3.
 pH of flotation tailing solution = 7.3.
 Ratios of concentration:

Copper-lead = 36.4:1.
 Zinc = 66.7:1.

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(Experimental Tests, cont'd) -

Conclusions:

It would not be economical to treat an ore by amalgamation for the recovery of gold and silver which is as low in these metals as the ore received.

Bulk concentration of the ore by flotation gave a concentrate which assayed 1.78 ounces of silver, 3.09 per cent copper, 1.48 per cent lead, and 2.94 per cent zinc. This grade of concentrate is too low for economical smelting treatment.

Selective flotation gave a copper-lead concentrate which is a commercial grade. The zinc concentrate was low grade, assaying 19.00 per cent zinc.

An ore having the mineral values as low as the one under investigation in this report, is of too low a grade for commercial operation of low tonnage per day.

Results of Selective Flotation

Product	Total, per cent	Assay, oz/ton					Distribution, per cent			
		Au	Ag	Cu	Pb	Zn	Ag	Cu	Pb	Zn
Feed	100.00	0.41	3.53	0.29	0.52	100.0	100.0	100.0	100.0	
Cu-Pb conc.	2.73	0.03	0.00	14.33	0.33	45.7	73.2	77.5	29.7	
Cu-Pb cleaner				0.00000000						
tailing	0.55			0.000000						
Zn conc.	1.50			3.98	0.42	19.00		11.2	2.3	54.7
Tailing	95.20	0.005	0.15	0.03	0.03	0.07	34.8	10.7	10.7	12.8

° Calculated value.

pH of the Cu-Pb flotation solution = 9.3.

Ratios of concentration:

Copper-lead = 36.4:1.
Zinc = 66.7:1.

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