

O T T A W A

September 2nd, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1290.

Concentration of a Lead-Zinc Ore  
from the Kootenay Florence Mining Company Limited,  
Ainsworth, British Columbia.

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Shipments:

Four lots of ore were received from the Kootenay Florence Mining Company Limited, per Dr. B. S. W. Buffam, Nelson, British Columbia. Details of these are as follows:

Lot 1 consisted of 4 sacks (440 pounds) and was received on July 15th, 1942. It was from the tailing dump,

(Shipments, cont'd) -

badly oxidized and agglomerated.

Lot 2 consisted of 25 samples, net weight 119 pounds, received on July 30th. A covering telegram from Dr. Buffam stated that these were all from underground, representing fresh ore, and could be combined for test work.

Lot 3, net weight 107 pounds, was received on August 3rd. This also represented fresh ore.

Lot 4 consisted of 9 small sacks, net weight 146 pounds, and was received on August 11th. A covering letter from Dr. Buffam stated this to be the least oxidized ore from the tailing dump at the Kootenay Florence mine and that all 9 sacks could be combined for test work.

Location of Property:

The property of the Kootenay Florence Mining Company Limited, from which the samples were received, is located near Ainsworth, British Columbia.

Sampling and Analysis:

The four lots were crushed, sampled and assayed by standard methods, the analyses being as follows:

	<u>Lot 1.</u>	<u>Lot 2.</u>	<u>Lot 3.</u>	<u>Lot 4.</u>
Copper, per cent -	0.07	0.18	0.51	0.10
Lead, " -	2.15	8.51	15.21	1.72
Zinc, " -	3.76	4.90	10.96	5.37
Iron, " -	11.95	10.51	10.87	12.12
Gold, oz./ton -	Trace	0.005	0.01	Trace
Silver, " -	0.59	2.24	3.54	0.54

Characteristics of the Ore and Zinc Concentrates:

ORE.

Six polished sections were prepared and examined under the reflecting microscope for the purpose of determining the character of the ore.

Gangue -

In the polished surfaces, gangue material is a mixture of soft grey rock, milky white quartz, and carbonate. In one or two sections the rock exhibits a distinct schistose structure and may represent a silicified and carbonated schist. That the sample has been taken from the zone of oxidation is attested by the numerous reddish brown stains of iron oxides.

Metallic Minerals -

In their approximate order of decreasing abundance, the metallic minerals observed in the six polished sections are: sphalerite, pyrite, marcasite, chalcopyrite, galena, and pyrrhotite.

Sphalerite is largely massive and in two sections forms the groundmass throughout which the other minerals are scattered. A small percentage is also disseminated in gangue as coarse to fine, irregular grains.

Pyrite occurs in gangue and in sphalerite as small masses and irregular grains, coarse to fine in size. It contains small inclusions and narrow veinlets of gangue as well as grains of marcasite, sphalerite, and pyrrhotite.

Marcasite is present as small disseminated grains and fine granular aggregates usually intimately associated with pyrite.

Chalcopyrite is unevenly distributed through gangue and sphalerite as coarse to very fine irregular grains.

Galena is disseminated in gangue as occasional small masses and

(Characteristics of the Ore and Zinc Concentrates, cont'd) -

irregular grains. Pyrrhotite is present in very small amount as rare to occasional tiny grains in sphalerite and in pyrite.

As already mentioned, "limonite" is visible staining gangue.

#### ZINC CONCENTRATES.

##### High Iron in Zinc Concentrates -

Zinc concentrates made from this ore have a high iron content, and a microscopic examination was made to see if it would reveal a reason for this. For this purpose, two polished sections were prepared (one from -14+28 mesh feed, the other from Zinc Concentrate No. 5) and examined under the reflecting microscope.

##### -14+28 Mill Feed.

The polished surface exhibits angular fragments, up to about 1 millimetre in size, embedded in the mounting medium (bakelite). These consist largely of sphalerite, galena, pyrite and gangue. Most of the sphalerite grains contain numerous tiny inclusions of pyrite, marcasite, chalcopyrite, and pyrrhotite, right down to the limits of the microscope (about 1 micron) in size.

##### Zinc Concentrate No. 5.

Zinc particles, up to about 125 microns in size, preponderate and, except for an occasional grain of pyrite, marcasite, or chalcopyrite, the product appears quite clean. However, as noted in the section prepared from the mill feed, many grains of sphalerite contain numerous tiny inclusions of iron and copper sulphides.

##### Conclusion from Microscopic Examination -

Since it is economically impossible to eliminate these fine inclusions from the sphalerite, it can be expected that any zinc concentrate made from this ore will run unusually high in iron and probably in copper.

Summary of Investigation:

Tailing Dump. - Lots 1 and 4.

Very poor work is indicated on this material. Lot 1 was particularly badly oxidized, requiring 38 pounds of soda ash to neutralize. Test work indicated lead recovery at 43.5 per cent with a lead grade of 52.5 per cent, and zinc recovery of 72 per cent, with a 51 per cent zinc grade. Lot 4 was more promising, indicated lead ~~recovery being 58 per cent~~ <sup>recovery being 58 per cent</sup> with a 57 per cent grade, and zinc recovery 93 per cent with a 52.6 per cent zinc grade. The latter results are better than may be expected on this material as a whole, as Lot 4 was reported as being from the least oxidized part of the dump.

Probable mill runs on this material would be as follows:

Lot 1.

Partic.	Weight,	Assays,			Distribution,		
	per cent	per cent			per cent		
		Pb	Zn	Fe	Pb	Zn	Fe
Feed	100.00	2.15	3.76	11.95	100.00	100.00	100.00
Lead conc.	1.77	52.50	9.10	5.50	43.47	3.10	0.81
Zinc "	5.36	0.10	50.60	11.50	2.00	72.09	5.15
Tailing	92.87	1.17	0.93	12.10	54.53	24.81	94.04
Products	100.00	2.15	3.76	11.95	100.00	100.00	100.00

Grind, 86 per cent minus 200 mesh.

Reagents:

Lead -

	Lb./ton
Ca(OH) <sub>2</sub>	6
NaCN	0.5
Potassium ethyl xanthate	0.05
Cresylic acid.	

Zinc -

Ca(OH) <sub>2</sub>	12	(pH, 10.8)
CuSO <sub>4</sub>	1	
Potassium ethyl xanthate	0.05	

(Summary of Investigation, cont'd) -

Lot 4.

	Weight, per cent	Assays, per cent			Distribution, per cent		
		Pb	Zn	Fe	Pb	Zn	Fe
Feed	100.00	1.7	5.37	12.12	100.00	100.00	100.00
Lead conc.	1.75	57.0	7.00	5.30	58.59	1.70	0.77
Zinc conc.	9.55	0.9	52.60	10.30	7.50	93.52	8.11
Tailing	88.70	0.65	0.29	12.45	33.91	4.78	91.12
Products	100.00	1.75	5.37	12.12	100.00	100.00	100.00

Grind, 86 per cent minus 200 mesh.

Reagents:

<u>Lead</u> -		<u>Lb./ton</u>	
Soda	-	10	(pH, 8.6)
NaCN	-	0.5	
Potassium ethyl xanthate	-	0.03	
Cresylic acid.			

<u>Zinc</u> -			
Lime	-	6	(pH, 9.4)
CuSO <sub>4</sub>	-	1	
Potassium ethyl xanthate	-	0.07	
Cresylic acid.			

Fresh Underground Ore. - Lot 2 and Lot 3.

No difficulty was experienced with either of these lots, good grade and recovery being attained in all tests. Provision should be made for cleaning both lead and zinc concentrates. Indicated results are as follows:

Lot 2.

	Weight, per cent	Assays, per cent			Distribution, per cent		
		Pb	Zn	Fe	Pb	Zn	Fe
Feed	100.00	8.51	4.90	10.51	100.00	100.00	100.00
Lead conc.	11.03	74.00	3.00	2.80	95.56	6.76	2.94
Zinc conc.	7.73	0.70	52.50	11.20	0.63	83.20	8.24
Tailing	81.24	0.40	0.60	11.40	3.81	10.04	88.82
Products	100.00	8.53	4.88	10.51	100.00	100.00	100.00

Grind, 78 per cent minus 200 mesh.

(Summary of Investigation, cont'd) -

Lot 2, cont'd.

Reagents:

Lead - Lb./ton

Soda	-	4
NaCN	-	0.5
Potassium ethyl xanthate	-	0.1
Cresylic acid.		

Zinc -

Lime	-	4
CuSO <sub>4</sub>	-	1
Potassium ethyl xanthate	-	0.05
Cresylic acid.		

Lot 3.

	: Weight, :			Assays,			: Distribution,		
	: per :			per cent			: per cent		
	: cent :	: Pb :	: Zn :	: Fe :	: Pb :	: Zn :	: Fe :		
Feed	: 100.00:	: 15.21:	: 10.96:	: 10.87:	: 100.00:	: 100.00:	: 100.00:		
Lead conc.	: 19.05:	: 75.90:	: 3.20:	: 4.57:	: 95.06:	: 5.56:	: 8.00:		
Zinc conc.	: 17.28:	: 1.40:	: 55.50:	: 10.30:	: 1.58:	: 87.47:	: 16.37:		
Tailing	: 63.67:	: 0.80:	: 1.20:	: 12.90:	: 3.36:	: 6.97:	: 75.63:		
Products	: 100.00:	: 15.21:	: 10.96:	: 10.87:	: 100.00:	: 100.00:	: 100.00:		

Grind, 86.5 per cent minus 200 mesh.

Reagents:

Lead - Lb./ton

Soda	-	4
NaCN	-	0.5
Potassium ethyl xanthate	-	0.05
Cresylic acid.		

Zinc -

Lime	-	4
CuSO <sub>4</sub>	-	1
Potassium ethyl xanthate	-	0.05
Aerofloat No. 25	-	0.01



(Summary of Investigation, cont'd) -

Typical samples of both lead and zinc concentrates were analyzed for impurities which might be detrimental to subsequent treatment. Results are as follows:

Lead Concentrate -

Antimony	-	None detected.
Arsenic	-	" "
Copper	-	1.5 per cent.
Bismuth	-	0.03 "
Insoluble	-	1.40 "
Silver	-	16.5 oz./ton.

Zinc Concentrate -

Cadmium	-	0.19 per cent.
Arsenic	-	None detected.
Copper	-	1.30 per cent.
Insoluble	-	0.44 per cent.
Silver	-	2.20 oz./ton.

Details of Investigation:

Representative tests, indicative of the above-mentioned probable mill runs, are as follows:

Lot 1, Test No. 7.

	Weight,		Assays,		Distribution,	
	per cent	cent	Pb	Zn	Pb	Zn
Lead cleaner conc.	1.40	52.44	9.13	33.8	3.1	
" " tailing	2.25	14.52	11.62	15.3	6.9	
" middling	1.77	4.77	11.60	4.0	5.5	
Zinc cleaner conc.	3.59	0.05	50.60	0.1	48.3	
" " tailing	2.90	1.33	25.00	1.9	19.3	
" middling	1.30	2.56	10.15	1.6	3.5	
Final tailing	86.79	1.07	0.58	43.3	13.4	
Products	100.00	2.15	3.76	100.0	100.0	

Lead float cleaned once - no reagents.

Zinc " " " - no reagents.

(Details of Investigation, cont'd) -

Lot 2, Test No. 3.

	:Weight, : per : cent	: Assays, : per cent			: Distribution, : per cent		
		: Pb	: Zn	: Fe	: Pb	: Zn	: Fe
Lead cleaner conc. :	8.6 :	74.18 :	3.03 :	2.83 :	77.41 :	4.81 :	2.27 :
" " tailing :	5.1 :	24.64 :	10.73 :	11.71 :	15.30 :	10.18 :	5.59 :
" middling :	2.0 :	12.27 :	3.00 :	8.43 :	3.03 :	1.11 :	1.59 :
Zinc cleaner conc. :	5.5 :	0.70 :	53.57 :	10.59 :	0.49 :	54.63 :	5.48 :
" " tailing :	6.1 :	1.25 :	11.68 :	33.16 :	0.97 :	13.15 :	18.94 :
" middling :	1.8 :	1.38 :	6.95 :	33.43 :	0.25 :	2.41 :	5.63 :
Final tailing :	70.9 :	0.29 :	1.04 :	9.12 :	2.55 :	13.71 :	60.50 :
Products :	100.0 :	8.24 :	5.40 :	10.68 :	100.00 :	100.00 :	100.00 :

Lead float cleaned twice with 0.1 lb./ton NaCN.  
Zinc " " " " 0.5 " Lime.

Lot 2, Test No. 5.

Lead cleaner conc. :	7.70 :	76.65 :	2.83 :	2.77 :	70.35 :	4.44 :	2.01 :
" " tailing :	6.52 :	29.74 :	13.46 :	12.37 :	23.15 :	17.98 :	7.71 :
" middling :	1.14 :	10.53 :	20.29 :	12.87 :	1.43 :	4.64 :	1.42 :
Zinc cleaner conc. :	5.69 :	2.19 :	50.50 :	10.89 :	1.55 :	57.98 :	5.90 :
" " tailing :	3.66 :	3.24 :	13.06 :	12.77 :	1.43 :	9.70 :	4.47 :
" middling :	2.17 :	0.35 :	2.78 :	39.40 :	0.09 :	1.21 :	8.18 :
Final tailing :	73.12 :	0.23 :	0.28 :	10.10 :	2.00 :	4.05 :	70.31 :
Products :	100.00 :	8.39 :	4.95 :	10.51 :	100.00 :	100.00 :	100.00 :

Lead float cleaned twice with 0.1 lb./ton NaCN.  
Zinc " " " " 1.0 " Lime

Lot 3, Test No. 1.

Lead cleaner conc. :	17.60 :	75.94 :	3.23 :	2.57 :	87.90 :	5.20 :	6.84 :
" " tailing :	6.36 :	21.91 :	18.47 :	11.78 :	9.13 :	10.68 :	6.37 :
" middling :	1.39 :	11.38 :	22.57 :	12.27 :	1.05 :	2.83 :	1.45 :
Zinc cleaner conc. :	13.13 :	0.09 :	55.56 :	10.29 :	0.07 :	66.61 :	11.50 :
" " tailing :	3.52 :	2.70 :	33.95 :	12.87 :	0.66 :	10.95 :	3.85 :
" middling :	3.47 :	0.95 :	4.25 :	34.39 :	0.20 :	1.36 :	10.15 :
Final tailing :	54.53 :	0.28 :	0.48 :	12.90 :	0.99 :	2.37 :	59.84 :
Products :	100.00 :	15.21 :	10.96 :	11.75 :	100.00 :	100.00 :	100.00 :

Lead float cleaned twice with 0.1 lb./ton NaCN.  
Zinc " " " " 1.0 " Lime.

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(Details of Investigation, cont'd) -

Lot 4, Test No. 3.

	Weight, per cent	Assays, per cent			Distribution, per cent		
		Pb	Zn	Fe	Pb	Zn	Fe
Lead cleaner conc.	1.01	56.97	7.03	5.27	33.92	1.32	0.44
" " tailing	2.42	24.86	7.97	9.28	35.52	3.58	1.85
Zinc cleaner conc.	5.53	0.85	52.57	11.30	2.77	53.94	7.00
" " tailing	5.35	2.31	35.72	11.92	7.31	35.46	5.26
" middling	3.17	1.34	8.91	27.39	2.48	5.24	7.16
Final tailing	82.52	0.37	0.03	11.50	18.00	0.46	78.29
Products	100.00	1.69	5.37	12.12	100.00	100.00	100.00

Zinc float cleaned twice with 1 pound lime per ton.

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TVL:GHB.