June 24, 1926

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES

Concentration of the zinc and copper-zinc ores of the Change Group, Boischatel Tp. Rouyn Mining District, Quebec.

by J. S. Godard

Shipment: A shipment of 140-lbs, consisting of two types of ore was received April 8, 1926. The ores were from the Change group of mining claims, Boischatel township, Rouyn mining district, Que. and were submitted by Messrs. Alderson & MacKay, New Birks Bldg. Montreal.

Characteristics of the ores : Type No. 1 is known as disseminated zinc ore and consists of zinc blende in a siliceous gangue. Type No. 2 is designated as heavy sulphide ore and consists of chalcopyrite, zinc blende, pyrrhotite and pyrite in a silicious gangue. A small quantity of galena is present showing only traces of lead in the analysis. Small amounts of gold and silver are also present, mainly associated with the chalcopyrite.

Purpose of experimental tests: The purpose of the tests was to concentrate the zinc blende in the disseminated zinc ore, and to separate and concentrate the chalcopyrite and zinc blende in the heavy sulphide ore.

Disseminated Zinc Ore

The entire lot of 45 pounds was crushed to ¼" and cut once, crushed to 14 mesh and cut three times, crushed to 50 mesh, and cut twice, then reduced to -150 mesh before cutting the head samples. The analysis was:

Lead	nil	Zinc	13.00 %
Copper	nil	Iron	3.28 %
Gold	nil	Insol.	71.95 %
Silver	0.04 oz/ton		

Test No. 1 - flotation at 100 mesh

Product	Weight %	Assay Zn %	% values Zn	Reagents	Amount lb/ton	Added to
Zinc conc.	25.8	46.13	92.5	Soda ash	4.0	Ball mill
Middling	8.9	5.47	3.8	Copper sulph	1.0	Flotn cell
Tailing	65.3	0.70	3.6	Xanthate	0.4	" "
				Pine oil #5	0.08	" "

Test No. 2 - flotation at 150 mesh

Zinc conc.	23.2	48.92	89.8	Soda ash	5.0	Ball mill
Middling	11.1	8.90	7.8	Barretts 634	0.4	" "
Tailing	65.7	0.46	2.4	TT	0.2	" "
				Copper sulph	2.0	Flotn Cell
				Pine oil	0.12	" "
				Xanthate	0.05	" "

No additional reagents were added in either test to clean the zinc concentrate

Heavy Sulphide Ore

The entire lot of 95 pounds was crushed to ½" and cut twice, crushed to -50 mesh and cut twice, crushed to -150 mesh and head sample cut out. The analysis was:

Lead	trace	Zinc	6.53 %
Copper	7.36 %	Iron	35.48 %
Gold	0.03 oz/ton	Insol.	18.6 %
Silver	2.45 "		

A number of selective flotation tests were made on this ore, the results of which are tabulated below:

Test No	Product	Weight %	Assays Cu %	Zn %	Au oz	Ag oz	Percent of values Cu	Zn	Au	Ag
1	Cu conc.	25.6	26.16	3.01	0.08	8.12	93.3	11.3	74.5	83.5
	Zn conc.	23.2	1.47	25.64	0.03	1.01	4.7	87.2	25.4	9.4
	Tailing	51.2	0.28	0.21	tr	0.35	2.0	1.5		7.1
2	Cu conc.	30.0	23.08	4.58	0.08	7.60	95.6	20.9	80.0	89.0
	Zn conc.	20.0	1.01	25.17	0.03	0.75	2.8	76.5	19.9	5.9
	Tailing	50.0	0.23	0.34	tr	0.26	1.6	2.6		5.1
3	Cu conc.	25.1	26.04	3.63	0.08	7.94	91.4	13.7	50.0	83.0
	Zn conc.	15.3	2.89	34.88	0.02	1.34	6.2	80.5	7.5	8.5
	Table conc.	5.5	0.13	0.31	0.11	0.35	0.1	0.3	15.0	0.8
	Tailing	54.1	0.30	0.67	0.02	0.34	2.3	5.4	27.5	7.7
4	Cu conc.	28.0	23.44	3.43	0.08	7.86	91.8	14.4	72.7	85.2
	Zn conc.	12.0	2.89	35.19	0.02	1.20	4.9	63.2	7.8	5.6
	Zn middling	19.8	0.73	6.95	0.01	0.61	2.0	20.6	6.5	4.7
	Tailing	40.2	0.24	0.29	0.01	0.29	1.3	1.8	13.0	4.5
5	Cu conc.	25.6	24.52	3.17	0.08	7.88	88.0	12.1	71.4	80.6
	Zn conc.	24.3	2.63	22.27	0.02	1.14	8.9	80.5	17.1	11.1
	Zn middling	17.0	0.63	2.08	tr	0.55	1.5	5.3		3.8
	Tailing	33.1	0.34	0.42	0.01	0.34	1.6	2.1	11.5	4.5
6	Cu conc.	27.2	25.68	3.06	0.08	8.06	97.0	13.0	66.1	86.8
	Zn conc.	9.2	1.02	48.71	0.02	1.09	1.3	70.0	5.4	3.9
	Zn middling	6.0	0.66	7.92	0.06	0.94	0.6	7.4	10.9	2.2
	Tailing	57.6	0.14	1.06	0.01	0.31	1.1	9.6	17.6	7.1
7	Cu conc.	30.2	22.62	4.00	0.08	7.12	95.5	18.5	75.3	88.3
	Zn conc.	8.5	1.60	46.03	0.02	1.12	1.9	60.1	5.3	3.9
	Zn middling	13.6	0.81	7.93	0.01	0.52	1.5	16.5	4.4	2.9
	Tailing	47.7	0.17	0.67	0.01	0.25	1.1	4.9	15.0	4.9

Test No	Product	Weight %	Assays Cu %	Zn %	Au oz	Ag oz	Percent of values Cu	Zn	Au	Ag
8	Cu conc.	28.0	23.74	5.68	0.08	7.04	93.0	16.1	75.4	76.0
	Zn conc.	9.8	1.22	47.38	0.01	0.81	1.7	72.9	3.4	3.1
	Zn middling	9.7	1.07	3.68	0.01	0.71	1.4	5.6	3.4	2.3
	Tailing	52.2	0.53	0.65	0.01	0.92	3.9	5.4	17.8	18.6
9	Cu conc.	27.5	22.88	8.03	0.08	6.46	88.1	34.7	79.2	82.3
	Zn conc.	9.3	2.87	38.01	0.01	1.11	3.7	55.6	3.2	4.8
	Zn middling	14.5	1.61	2.34	tr	0.61	3.3	5.3		4.1
	Tailing	48.7	0.72	0.57	0.01	0.39	4.9	4.4	17.6	8.8
10	Cu conc.	29.0	21.78	4.05	0.08	6.06	86.7	17.9	82.3	80.0
	Zn conc.	12.9	4.39	38.11	0.02	1.56	7.8	75.0	9.2	9.2
	Zn middling	12.2	1.49	2.49	0.02	0.67	2.5	4.6	8.5	3.7
	Tailing	45.9	0.47	0.35	tr	0.34	3.0	2.5		7.1
11	Cu conc.	29.3	21.22	4.26	0.08	7.68	86.6	19.3	79.0	84.4
	Zn conc.	11.4	3.56	40.79	0.01	1.37	5.5	71.9	3.8	5.9
	Zn middling	7.9	2.33	3.68	tr	1.02	2.6	4.5		3.0
	Tailing	51.4	0.74	0.54	0.01	0.35	5.3	4.3	17.2	6.7
12	Cu conc.	28.2	24.38	3.37			95.6	14.8		
	Zn conc.	10.7	1.19	48.41			1.8	78.3		
	Zn middling	11.1	0.90	3.32			1.4	5.7		
	Tailing	50.0	0.17	0.16			1.2	1.2		
13	Cu conc.	32.1	21.80	3.32			97.0	16.2		
	Zn conc.	16.2	0.55	31.68			1.2	77.7		
	Zn middling	18.6	0.39	1.45			1.0	4.1		
	Tailing	33.1	0.18	0.39			0.8	2.0		

Reagents used:

Test No	Reagent	Amount lb/ton	Added at	Remarks
1	Soda ash	5.0	Ball mill	Ore ground to 100 mesh
	Thiocarbanilide	0.20	" "	
	Sodium cyanide	0.40	" "	
	Copper sulphate	2.00	Cell	
	Xanthate	0.40	"	
	Pine oil #5	0.10	"	
2	Cu Lime	1.5	Ball mill	Ore ground to 200 mesh.
	Soda ash	2.0	" "	Lime added full time
	Copper sulphate	0.20	Cell	contact. Soda ash 1/3 time
	Xanthate	0.20	"	contact
	Pine oil #5	0.08	"	
	Zn Soda hydroxide	0.60	"	
	Copper sulphate	2.00	"	
	Xanthate	0.40	"	
	Pine oil #5	0.08	"	
3	Cu Soda ash	5.00	Ball mill	Ore ground to 150 mesh
	Sodium cyanide	0.20	" "	
	Thio carbanilide	0.20	" "	
	Water gas tar	0.08	" "	
	Cresylic acid	0.04	" "	
	Zn Copper sulphate	2.00	Cell	
	Xanthate	0.20	"	
	Pine oil #5	0.08	"	
4	Cu Lime	2.00	Ball mill	Ore ground to 150 mesh
	Soda ash	2.00	" "	Lime added full time
	Thiocarbanilide	0.20	" "	contact. Other reagents
	Sodium cyanide	0.50	" "	added to ball mill half
	Pine oil #5	0.08	Cell	time contact
	Zn Copper sulphate	2.00	"	Denser pulp than in
	Xanthate	0.30	"	previous tests
	Pine oil #5	0.08	"	

Test No	Reagent	Amount lb/ton	Added at	Remarks
5	Cu Lime	2.0	Ball mill	Ore ground to 150 mesh.
	Soda ash	2.0	" "	Lime full time contact
	Sodium cyanide	0.5	" "	Other reagents added to ball
	Barretts #4	0.4	" "	mill ½ time contact
	Cresylic acid	0.05	Cells	Pulp density as in Test 4
	Pine oil #5	0.04	"	
	Zn Copper sulphate	2.0	"	
	Xanthate -	0.3	"	
	Pine oil #5	0.08	"	
6	Cu Soda ash	4.00	Ball mill	Copper removed at 100 mesh
	Sodium cyanide	0.3	" "	Tailings dewatered and
	Thiocarbanilid	0.2	" "	reground to 200 mesh before
	Cresylic acid	0.08	Cells	floating zinc
	Zn Soda ash	3.0	Ball mill	
	Copper sulphate	1.50	Cells	
	Xanthate	0.3	"	
	Pine oil #5	0.08	"	
7	Cu Soda ash	4.00	Ball mill	Copper removed at 100 mesh
	Sodium cyanide	0.3	" "	Tailing dewatered and
	Thiocarbanilide	0.2	" "	reground to 200 mesh before
	Cresylic acid	0.08	Cell	floating zinc.
	Zn Lime	5.00	Ball mill	
	Copper sulphate	1.5	Cell	
	Xanthate	0.3	"	
	Pine oil #5	0.08	"	
8	Cu Soda ash	4.0	Ball mill	Ore ground to 150 mesh
	Sodium cyanide	0.3	" "	
	Thiocarbanilide	0.2	" "	
	Cresylic acid	0.08	" "	
	Copper sulphate	0.4	Cell	
	Zn Copper sulphate	1.5	"	
	Xanthate	0.3	"	
	Pine oil #5	0.08	"	
9	Cu Soda ash	4.0	Ball mill	Ore ground to 150 mesh
	Sodium cyanide	0.3	" "	Barretts #634 did not mix -
	Barretts #4	0.25	" "	Xanthate was added
	Cresylic acid	0.08	" "	
	Copper sulphate	0.4	Cell	
	Cresylic acid	0.08	"	
	Pine oil #5	0.08	"	
	Zn Copper sulphate	1.5	"	
	Barretts #634	0.2	"	
	Xanthate	0.35	"	
	Pine oil #5	0.08		
10	Cu Soda ash	5.0	Ball mill	Ore ground to 6% +200 mesh
	Sodium cyanide	0.2	" "	
	Coal tar 40% Coal tar creo 60%	0.3	" "	
	Cresylic acid	0.08	" "	
	Pine oil #5	0.08	Cell	
	Zn Copper sulphate	1.50	"	
	Xanthate	0.3	"	
	Pine oil #5	0.08	"	
11	Cu Soda ash	5.0	Ball mill	Ore ground to 2% +200 mesh
	Water gas tar	0.3	" "	
	Sodium cyanide	0.2	" "	
	Cresylic acid	0.08		
	Pine oil #5	0.08	Cell	
	Zn Copper sulphate	1.5	"	
	Xanthate	0.4	"	
	Pine oil #5	0.08	"	
12	Cu Soda ash	5.0	Ball mill	Ore ground to 150 mesh
	Sodium cyanide	0.35	" "	
	Thiocarbanilide	0.2	" "	
	Cresylic acid	0.08	" "	
	Pine oil #5	0.04	Cell	

Test No	Reagent	Amount lb/ton	Added at	Remarks
12 (cont)				
	Zn Copper sulphate	1.50	Cell	
	Xanthate	0.25	"	
	Pine oil #5	0.04	"	
13	Cu Soda ash	5.0	Ball mill	Ore ground to +200 mesh
	Sodium cyanide	0.35	" "	
	Thio carbanilide	0.25	" "	
	Cresylic acid	0.06	" "	
	Pine oil #5	0.04	Cell	
	Zn Copper sulphate	1.50	"	
	Xanthate	0.3	"	
	Pine oil #5	0.04	"	

Conclusions:

1. Disseminated zinc ore - No difficulty was experienced in obtaining a zinc concentrate containing more than 45% zinc with a recovery of over 90%, when the material was ground to -100 mesh.

2. Heavy sulphide ore - Excellent separation of the copper from the zinc was obtained in these tests on ore ground to -100 mesh. The copper recoveries and the grade of the copper concentrate were both good. 95% of the copper was obtained in the concentrate containing about 24% copper and 3.5% zinc.

The zinc recoveries were good, 70% of the zinc being recovered in three tests, Nos. 6, 8 & 12, in concentrates assaying more than 45% zinc. Grinding to 150 mesh is necessary in order to make a good separation of the zinc from the pyrite and pyrrhotite.

75% of the gold and 80% of the silver is recovered with the chalcopyrite. The gold in the copper concentrate amounted to 0.08 oz/ton in each test and the silver in the same product amounted to about 7 oz/ton. 3½ to 5% additional gold and about the same quantity of silver was recovered in the zinc concentrate.

In test No. 3 the tailing from the zinc cell was tabled. This operation recovered an additional 15% of the gold values. As only 50% of the gold present was recovered in this test in the copper concentrate, it cannot be assumed that this recovery of gold could be obtained by table concentration where 75% of the gold reports with the copper concentrate. Tabling would no doubt recover sufficient gold in a concentrate of small bulk to pay for the operation and would be very valuable as an indicator of the performance of the zinc cells. Such a product could be mixed with the copper concentrate.