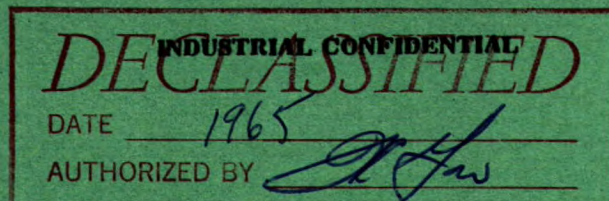


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CANADA



DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 65-45

# FLOTATION OF A COPPER-ZINC ORE FROM THE BRABANT LAKE AREA, NORTHERN SASKATCHEWAN

by

T. F. BERRY

MINERAL PROCESSING DIVISION

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SUMMARY OF RESULTS

The ore sample submitted for investigation was of marginal grade, analyzing 0.66% Cu and 2.28% Zn.

In all tests difficulty was experienced in rejecting the zinc from the copper concentrates and, although high grade copper and zinc concentrates were obtained, the recoveries of the copper and zinc in final concentrates were low.

In Test 4 the copper concentrate analyzed 25.17% Cu and 12.95% Zn with a recovery of 75.6% of the copper and the zinc concentrate analyzed 51.70% Zn with a recovery of 59.1% of the zinc.

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\*Technical Officer, Mineral Processing Division, Department of Mines and Technical Surveys, Ottawa, Canada.



## INTRODUCTION

On January 24, 1964, Mr. B.R. Richards of the Pre Cam Exploration and Development Ltd., Box 95, La Ronge, Saskatchewan asked the Mineral Processing Division of the Mines Branch to conduct a test program on a zinc-copper ore from the Brabant Lake property in Saskatchewan. This ore body is now controlled by Bison Petroleum and Minerals Limited, 201 Brent Building, 11th Ave. and McIntyre Street, Regina, Saskatchewan.

### Location of Property

The ore deposit is located at the north end of Brabant Lake in northern Saskatchewan at longitude 56°97' west and 103°40' north. It is within one mile of the northern extension of No. 2 highway which will be linked to the property in one or two years.

### Shipment

A 160 lb sample of zinc-copper ore was received at the Mines Branch in February 1964.

### Sampling and Analysis

Representative samples were submitted to the mineralogy laboratory for a mineralogical investigation. The remainder of the sample was crushed to -10 mesh and riffled into 2000 gram test samples. From one of these test samples a head sample was riffled for a chemical analysis. The results are given in Table 1.

TABLE 1

#### Results of Chemical Analysis\* on Head Sample

Element	Analysis
Gold (Au)	0.0025 oz/ton
Silver (Ag)	0.55 " "
Copper (Cu)	0.66 per cent
Zinc (Zn)	2.28 " "
Lead (Pb)	0.065 " "
Iron (Sol Fe)	8.98 " "
Sulphur (tot S)	8.65 " "
Nickel (Ni)	0.10 " "
Insoluble	71.70 " "

\*From Internal Report MS-AC-64-414.



# Mineralogical Examination\*

The specimens consisted of weathered rock that contained disseminated metallic minerals. The rock was composed of quartz, feldspar, a fibrous amphibole, biotite and chlorite, and in places was coated with goethite. The disseminated metallic minerals were pyrite, chalcopyrite, sphalerite, marcasite, galena and pyrrhotite. The pyrite occurred as irregular grains which sometimes exhibited a colloform texture. Some of the pyrite contained minute inclusions of pyrrhotite and sphalerite. The chalcopyrite, sphalerite, marcasite and galena occurred as irregular grains that ranged from several microns to several millimeters in size. The sphalerite contained minute rounded inclusions of pyrrhotite and chalcopyrite, and its cell parameter was 5.417 Å, indicating a content of 17.2 mol % FeS.

## DETAILS OF INVESTIGATION

### Test 1-a-b-c

A series of three preliminary tests was done to determine the grinding time necessary for good mineral liberation and to assess the flotation characteristics of the minerals.

TABLE 1-a

Flotation Data Test 1-a-b-c

Test No.	1-a		1-b		1-c	
Grind % -200 mesh	60.7		71.1		86.5	
Rougher Flotation	Cu	Zn	Cu	Zn	Cu	Zn
<u>Reagents lb/ton feed</u>						
Lime	4.0	1.20	4.0	1.6	4.2	1.6
NaCN	0.1	-	0.1	-	0.1	-
ZnSO <sub>4</sub>	0.3	-	0.3	-	0.3	-
CuSO <sub>4</sub>	-	2.0	-	2.0	-	2.0
Pot. amyl xanthate	0.06	0.02	0.04	0.02	0.05	0.02
Sodium Aerofloat	0.06	0.02	0.04	0.02	0.05	0.02
Dowfroth 250	0.03	0.04	0.04	0.04	0.04	0.06
Conditioning time min	3	5	3	5	3	5
pH	8.5	10.3	8.3	10.0	8.8	10.2
Flotation time min	2	4	2	3	3½	3

\*From Mineral Sciences Division, Internal Report MS-64-27 by W. Petruk.



TABLE 1-b

Results of Flotation Tests 1-a, 1-b, 1-c

Test No.	Grind % -200 M	Product	Weight %	Analysis %*		Distribution %	
				Cu	Zn	Cu	Zn
1-a	60.7	Cu Conc	2.6	18.86	7.34	74.7	8.9
		Zn "	6.2	1.37	28.08	12.9	81.7
		Flotn tail	91.2	0.09	0.22	12.4	9.4
		Head (calcd)	100.0	0.66	2.13	100.0	100.0
1-b	71.1	Cu Conc	3.3	16.52	8.75	79.7	13.0
		Zn "	5.4	1.17	31.97	9.2	77.9
		Flotn tail	91.3	0.08	0.22	11.1	9.1
		Head (calcd)	100.0	0.68	2.22	100.0	100.0
1-c	86.5	Cu Conc	9.4	6.22	5.07	85.3	21.8
		Zn "	6.6	0.80	23.76	7.7	71.7
		Flotn tail	84.0	0.06	0.17	7.0	6.5
		Head (calcd)	100.0	0.68	2.19	100.0	100.0

\*From Internal Report MS-AC-64-412.

Test 2

A 2000 gram sample of -10 mesh ore was ground to 69.5% -200 mesh and was floated as is shown in Table 2-a. The results are shown in Table 2-b.



TABLE 2-a

Flotation Data Test 2

Reagents lb/ton feed	Grind	Condition		Rougher Flotation		Cleaner Flotation	
		Cu	Zn	Cu	Zn	Cu	Zn
Lime	4.2		1.6				
NaCN	0.1						
ZnSO <sub>4</sub>	0.3						
CuSO <sub>4</sub>			2.0				
Pot. amyl xanthate		0.05		0.01	0.01		
Sodium Aerofloat			0.06				
Dowfroth 250				0.06	0.06		0.02
Grind % -200 Mesh	69.8						
Time, min	20	3	5	3	4	1½	2
pH	8.7		10.0				

TABLE 2-b

Results of Flotation Tests

Product	Weight %	Analysis %*		Distribution %	
		Cu	Zn	Cu	Zn
Cu cl conc	2.2	22.06	9.07	74.8	8.8
Cu cl tail	0.8	2.72	9.88	3.4	3.5
Zn cl conc	3.8	0.92	43.85	5.4	73.8
Zn cl tail	1.6	0.96	3.61	2.4	2.6
Flotn tail	91.6	0.10	0.28	14.0	11.3
Head (calcd)	100.0	0.65	2.26	100.0	100.0

\*From Internal Report MS-AC 64-412.

Test 3

The ground pulp in this test was subjected to 20 minutes of aeration in a pachuca tank prior to flotation.



TABLE 3-a

Flotation Data Test 3

Reagents lb/ton feed	Grind	Aeration	Condition		Rougher Flotation			Cleaner Flotation			
			Cu	Zn	Cu	Zn	Scav	1st Cu	2nd Cu	1st Zn	2nd Zn
Lime	4.2		1.0	5				0.05			
NaCN	0.2							0.005	0.00125		
ZnSO <sub>4</sub>	0.6										
CuSO <sub>4</sub>				1.0							
Pot. amyl xanthate			0.04								0.015
Sod. Aerofloat				0.04		0.02	0.02				
Dowfroth 250					0.04	0.04	0.02				0.002
Grind % -200 mesh	86.5										
Time min	30	20	3	5	2	4	2	2	1½	2½	2
% Solids	66		40								
pH	7.9	7.0	8.3	10.6		10.0	9.8	9.8	8.9	10.0	9.8

TABLE 3-b

Results of Flotation Test 3

Product	Weight %	Analysis %*		Distribution %	
		Cu	Zn	Cu	Zn
Final Cu conc	1.8	26.48	8.93	63.6	6.0
2nd Cu cl tail	0.5	10.32	13.23	6.9	2.5
1st " " "	1.6	3.17	9.94	6.8	5.9
Final Zn conc	2.2	1.69	50.18	5.0	41.1
2nd Zn Cl tail	3.7	1.38	27.51	6.8	37.9
1st " " "	1.5	0.37	1.78	0.7	1.0
Scavenger Conc	3.8	0.31	0.15	1.6	0.2
Flotn tail	84.9	0.08	0.17	8.6	5.4
Head (calcd)	100.0	0.75	2.68	100.0	100.0

\*From Internal Report MS-AC-64-504.

Test 4

In this test the ZnSO<sub>4</sub> used in Test 3 as a sphalerite depressant was replaced with sodium sulphite and sodium carbonate replaced the lime in the grind.



TABLE 4-a

Flotation Data Test 4

Reagents lb/ton feed	Grind	Aeration	Condition		Rougher Flotation		Cleaner Flotation					
			Cu	Zn	Cu	Zn	1st Cu	2nd Cu	3rd Cu	1st Zn	2nd Zn	3rd Zn
Na <sub>2</sub> CO <sub>3</sub>	5.0	2.0	.5									
NaCN	0.1		0.1									
Na <sub>2</sub> SO <sub>3</sub>	0.3											
CuSO <sub>4</sub>				2.0								
Lime				4.5							0.25	
Pot. amyl xanthate			0.04									
Sodium Aerofloat				0.04		0.025						
Dowfroth 250					0.04	0.015	0.01	0.01	-	-	-	-
Grind, % -200 mesh	86.5											
Time, min	30	20	3	5	3	5	2	1.5	1.5	2.5	1.5	1.5
% Solids	66		40									
pH	6.8	7.3	7.8	11.2			7.7	7.5	7.3	10.8	11.5	11.0



TABLE 4-b

Results of Flotation Test 4

Product	Weight %	Analysis %*		Distribution %	
		Cu	Zn	Cu	Zn
Final Cu conc	2.2	25.17	12.95	75.6	13.6
3rd Cu cl tail	0.3	7.24	24.56	3.0	3.5
2nd " " "	0.4	5.58	17.69	3.0	3.4
1st " " "	0.9	1.73	7.71	2.1	3.3
Final Zn conc	2.4	0.79	51.70	2.6	59.1
3rd Zn cl tail	0.6	1.69	25.59	1.4	7.3
2nd " " "	1.2	0.91	7.01	1.5	4.0
1st " " "	5.6	0.23	0.99	1.8	2.6
Flotn tail	86.4	0.08	0.25	9.0	3.2
Head (calcd)	100.0	0.73	2.10	100.0	100.0

\*From Internal Report MS-AC-64-452.

RESULTS

In Test 3 the copper concentrate analyzed 26.48% Cu and 8.93% Zn and contained 63.6% of the copper. In the same test the zinc concentrate analyzed 50.18% Zn at a recovery in the final concentrate of 41.1% of the zinc.

In Test 4 the recovery of copper in a final concentrate was increased to 75.6% but the amount of zinc in this concentrate also increased.

CONCLUSIONS

The ore appeared to be oxidized probably as a result of surface oxidation and, although copper concentrates analyzing as high as 26% Cu with a recovery of 75% were obtained, difficulty was experienced in rejecting the zinc from these concentrates. Considering the location of the property, ore analyzing 0.66% Cu and 2.28% Zn is of marginal grade. While it is possible that test work on fresh unoxidized ore might result in better grades and recoveries of the copper and zinc, it is recommended that any further work be done on a higher grade sample.