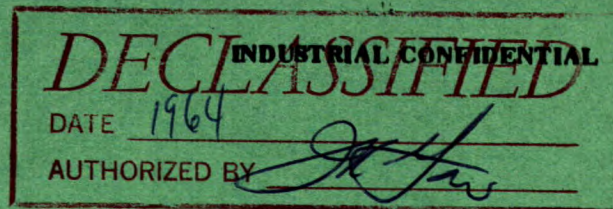


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DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 63-90

**INVESTIGATION OF FLOTATION PROBLEMS
ON COPPER ORE FROM ATLANTIC COAST
COPPER CORPORATION, LIMITED,
SPRINGDALE, NEWFOUNDLAND**

by

G. O. HAYSLIP

MINERAL PROCESSING DIVISION

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COPY NO. 25

AUGUST 20, 1963

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ORE FROM ATLANTIC COAST COPPER CORPORATION,
LIMITED, SPRINGDALE, NEWFOUNDLAND

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G. O. Hayslip*

SUMMARY OF RESULTS

Results of these tests done on a sample of current mill feed confirmed the test work done previously. The ore was found to float easily with very small amounts of reagents. Rougher recovery of copper was 93.5% compared with 95.2% on the previous shipment.

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INTRODUCTION

Location of Property

The shipment was from an operating mine situated on the north side of Little Bay, Notre Dame Bay, on the northeastern part of the Island of Newfoundland and approximately 11 miles north of the town of Springdale.

The property was operated during the 1880's and has been reopened recently. Milling operations began in April 1961.

Shipment

A shipment of 300 pounds of ore was received on May 24, 1962. This shipment was submitted by Mr. Leslie G. Hudson, Assistant to the Managing Director, Atlantic Coast Copper Corporation, Limited, 140 Wellington Street, Ottawa 4, Ontario.

Purpose of Investigation

Test work had been done previously on samples of fresh ore and oxidized ore from this property and reported in Mines Branch Investigation Report IR 59-114 "Flotation Tests of Copper Ore from Atlantic Coast Copper Corporation, Limited, Springdale, Newfoundland".

Results obtained in milling operations were not as good as those obtained in test work and it was felt that tests on a sample of current feed would show if there was any difference in the ore being milled from that on which tests had been done or, if lack of control in the plant was affecting the operations. Following a conversation with Mr. Hudson it was decided to check the results obtained previously by repeating the tests on a new sample of ore

Sampling and Analysis

The sample was crushed to minus 10 mesh and a representative sample was riffled out for chemical analysis and mineralogical study. The chemical analysis* was as follows:

Copper	0.90%
Iron	14.3 %
Sulphur	4.3 %

*From Internal Report MS-AC-62-701

MINERALOGICAL EXAMINATION*

A portion of the head sample was submitted for microscopic examination to compare it with the previously submitted samples. The conclusions were as follows:

The metallic minerals in the sample are chalcopyrite, pyrite, goethite or limonite and small amounts of magnetite. The non-metallic minerals are chlorite, calcite, quartz, a clay mineral, and a trace of biotite.

The mineralogy of this sample corresponds closely to that described by W. E. White in Internal Report MS-59-17 entitled "Microscopic Examination of Two Samples of Copper Ore from Atlantic Coast Copper Mines, Little Bay, Newfoundland".

DETAILS OF INVESTIGATION

Several tests were done to duplicate the condition obtained in the previous test work. Samples were usually ground in 1000 g lots at 57 per cent solids. Rougher flotation was done in a 1000 g cell. To obtain sufficient concentrate for a cleaning test, several rougher floats were made. The rougher concentrates were combined and then floated.

Test No. 1

A sample of ore was ground for 12 min, conditioned in a flotation cell with reagents, and then floated.

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u> - lb/ton	<u>Time, min.</u>	<u>pH</u>
Grind (61.1%-200 M)		12	
Conditioning	Reagent 325 - 0.03	2	7.6
Rougher flotation	Dowfroth 250 - 0.05	7 1/2	

*Abstract from Mineral Sciences Division Test Report No. MS-62-19
by W. Petruk, June 22, 1962.

TABLE 1

Results of Test No. 1

Product	Weight %	Assays* % Cu	Distn % Cu
Feed (calcd)	100.0	0.95	100.0
Cu rougher conc	8.6	10.16	91.6
Cu rougher tailing	91.4	0.09	8.4

Test No. 2

This test was similar to test No. 1 except that the grinding time was increased to 15 min to give a grind of 69.5 per cent minus 200 M.

TABLE 2

Results of Test No. 2

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.95	100.0
Cu rougher conc	7.9	11.02	91.6
Cu rougher tailing	92.1	0.09	8.4

*From Internal Report MS-AC-62-718

Test No. 3

This test was done under similar conditions to the previous tests with the exception that the grinding time was increased to 20 minutes to give a grind of 79.8 per cent minus 200 M.

TABLE 3

Results of Test No. 3

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.92	100.0
Cu rougher conc	6.8	12.15	90.2
Cu rougher tailing	93.2	0.10	9.8

*From Internal Report MS-AC-62-701

Since all of the above tests had a low grade of rougher concentrate it was decided to increase the pH by the addition of lime keeping the grind constant at 69.5 per cent minus 200 M.

Test No. 4

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u>	<u>- lb/ton</u>	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)	Lime	- 0.5	15	
Conditioning	Reagent 325	- 0.03	2	8.2
Rougher flotation	Dowfroth 250	- 0.05	7 1/2	

TABLE 4

Results of Test No. 4

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.95	100.0
Cu rougher conc	7.8	11.24	92.6
Cu rougher tailing	92.2	0.08	7.4

*From Internal Report MS-AC-62-718

Test No. 5

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u> - lb/ton	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)	Lime - 1.0	15	
Conditioning	Reagent 325 - 0.03	2	8.6
Rougher flotation	Dowfroth 250 - 0.05	7 1/2	

TABLE 5

Results of Test No. 5

<u>Product</u>	<u>Weight %</u>	<u>Assay* % Cu</u>	<u>Distn. % Cu</u>
Feed (calcd)	100.0	0.93	100.0
Cu rougher conc	7.5	11.61	93.5
Cu rougher tailing	92.5	0.07	6.5

*From Internal Report. MS-AC-62-718

Test No. 6

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u> - lb/ton	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)	Lime - 1.5	15	
Conditioning	Reagent 325 - 0.03	2	9.4
Rougher flotation	Dowfroth 250 - 0.05	7 1/2	

TABLE 6

Results of Test No. 6

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.96	100.0
Cu rougher conc	6.7	13.22	92.7
Cu rougher tailing	93.3	0.08	7.3

*From Internal Report MS-AC-62-769

Test No. 7

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u>	<u>- lb/ton</u>	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)	Lime	- 2.0	15	
Conditioning	Reagent 325	- 0.03	2	10.9
Rougher flotation	Dowfroth 250	- 0.05	7 1/2	

TABLE 7

Results of Test No. 7

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.92	100.0
Cu rougher conc	4.9	17.20	91.3
Cu rougher tailing	95.1	0.08	8.7

*From Internal Report MS-AC-62-769

A series of tests was made in which the amounts of promoter was decreased along with the pH.

Test No. 8

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u>	<u>- lb/ton</u>	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)	Lime	- 1.5	15	9.3
Conditioning	Reagent 325	- 0.02	2	
Rougher flotation	Dowfroth 250	- 0.05	7 1/2	

TABLE 8

Results of Test No. 8

<u>Product</u>	<u>Weight %</u>	<u>Assay* % Cu</u>	<u>Distn % Cu</u>
Feed (calcd)	100.0	0.96	100.0
Cu rougher conc	5.5	15.91	91.7
Cu rougher tailing	94.5	0.08	8.3

*From Internal Report MS-AC-62-769

Test No. 9

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u>	<u>- lb/ton</u>	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)	Lime	- 1.5	15	9.5
Conditioning	Reagent 325	- 0.01	2	
Rougher flotation	Dowfroth 250	- 0.05	7 1/2	

TABLE 9

Results of Test No. 9

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.94	100.0
Cu rougher conc	4.6	18.17	89.4
Cu rougher tailing	95.4	0.10	10.6

Test No. 10

Reagents and Conditions

<u>Operation</u>	<u>Reagents - lb/ton</u>	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M)		15	
Conditioning	Reagent 325 - 0.01	2	8.0
Rougher flotation	Dowfroth 250 - 0.05	7 1/2	

TABLE 10

Results of Test No. 10

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.94	100.0
Cu rougher conc	6.7	12.79	91.5
Cu rougher tailing	93.3	0.09	8.5

*From Internal Report MS-AC-62-769

Test No. 11

Reagents and Conditions

<u>Operation</u>	<u>Reagents</u>	<u>- lb/ton</u>	<u>Time, min</u>	<u>pH</u>
Grind (69.5%-200 M) 2, 2000 g lots	Lime	- 1.5	15	
Conditioning	Reagent 325	- 0.03	2	9.3
Rougher flotation	Dowfroth 250	- 0.05	7 1/2	
Cleaner flotation			2 1/2	

TABLE 11

Results of Test No. 11

Product	Weight %	Assay* % Cu	Distn % Cu
Feed (calcd)	100.0	0.94	100.0
Cu cleaner conc	2.8	25.26	75.5
Cu cleaner tailing	3.6	4.49	17.0
Cu rougher tailing	93.6	0.08	7.5

*From Internal Report MS-AC-62-856

CONCLUSIONS

Results obtained in the test work on this shipment of ore were almost as good as the results obtained on the first shipment. The difference in results is due probably to the fact that this ore was lower in grade and contained a mixture of fresh and oxidized ore. In the test work on the first shipment, the fresh ore and oxidized ore were treated separately.

The second shipment of ore required the addition of some lime in order to obtain a good grade of rougher concentrate. The grade seemed to increase with pH although copper recovery dropped off slightly. No attempt was made to find the optimum conditions and a pH of 9.5 was used for most of the comparative test work.

Laboratory testing has shown that the chalcopyrite in this ore is floated very easily and, in Test No. 10 the amount of xanthate was reduced to 0.01 lb per ton and the amount of lime was reduced to give a pH of 8.0 with little change in recovery. Grade of concentrate dropped, but it is felt that this could be cleaned easily to the required grade. No attempt was made to obtain optimum conditions.

In plant operations it has not been possible to obtain satisfactory results with small quantities of reagents. A considerable amount of lime is added to the grinding circuit, reagents 238, 404 and Z-6 are added to conditioning and sodium cyanide is added to the cleaning circuit. The amounts of reagents used are much in excess of those used in the test work which is the opposite of the usual practice where plant operation usually results in a decrease in the amount of reagents used. From correspondence with Mr. A.D. Coggan, Mill Superintendent, it was learned that the larger amounts of these reagents were necessary to compensate for fluctuations in the amount of oxidized ore in the mill feed.

Sodium cyanide was not used in laboratory testing and it was found that a very small amount of reagent Z-4 gave a selective float of the chalcopyrite. It is felt that when plant and mining operations are stabilized, a reduction of both promoter and sodium cyanide might give the same results as are being obtained at present.

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