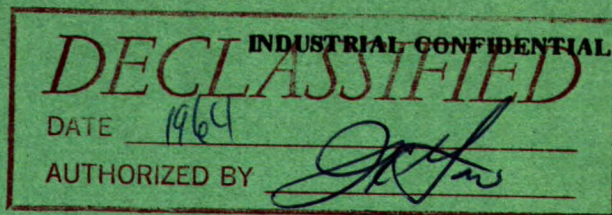


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CANADA



DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 63-40

**BISMUTH RECOVERY FROM A SAMPLE OF  
MILL TAILING, FROM MOLYBDENITE  
CORPORATION OF CANADA LTD.,  
VAL D'OR, QUEBEC**

by

**G. I. MATHIEU**

**MINERAL PROCESSING DIVISION**

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BISMUTH RECOVERY FROM A SAMPLE OF MILL TAILING,  
FROM MOLYBDENITE CORPORATION OF CANADA LTD.,  
VAL D'OR, QUEBEC

by

G. I. Mathieu<sup>\*</sup>

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SUMMARY OF RESULTS

Table concentration of the mill tailing recovered only a small percentage of the contained bismuth due to the fine grained nature of the bismuth minerals.

Flotation concentration recovered 50.2 per cent of the bismuth from the mill tailing in a concentrate having a ratio of concentration of 31:1. This reduced the final tailing assay to 0.007 per cent Bi.

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## INTRODUCTION

### Location of Property

Molybdenite Corporation of Canada Ltd. is a molybdenum-bismuth producer operating a mine nineteen miles north of Val d'Or, Quebec.

### Shipment and Purpose of Investigation

An 8 lb sample of the current mill tailing containing 0.013% Bi was submitted to the Mines Branch by Mr. Florent Baril, Mill Superintendent, with a request for an investigation to determine if the bismuth recovery could be improved in the normal mill.

## DETAILS OF INVESTIGATION

### Test 1

A 2000 g sample of the mill tailing was fed to a Deister table which produced a concentrate and a tailing. The concentrate was cleaned in a superpanner because of the very small amount available.

TABLE 1

### Results of Gravity Concentration

Product	Weight %	Assays* % Bi	Distribution % Bi
Superpan Bi conc	0.2	0.68	13.3
Superpan Bi tail	1.7	0.023	3.3
Table tail	98.1	0.010	83.4
Feed (calcd)	100.0	0.012	100.0

\*From Internal Report MS-AC-62-151, Jan. 3, 1963.

A screen and infrasizer size analysis was made on the table tailing with the following results:

TABLE 2  
Size Analysis of Table Tailing

Size	Weight %	Assays* % Bi	Distribution % Bi
+35m	4.9	0.002	1.2
-35m+48m	9.4	0.004	4.7
-48m+65m	14.9	0.005	9.2
-65m+100m	14.7	0.007	12.7
-100m+150m	12.8	0.007	11.0
-150m+200m	10.3	0.006	7.6
-200m+56mu	5.9	0.008	5.8
-56mu+40mu	8.7	0.008	8.6
-40mu+28mu	7.2	0.011	9.7
-28mu+20mu	4.3	0.016	8.5
-20mu+10mu	3.3	0.017	6.9
-10mu	3.6	0.032	14.1
Table tail (calcd)	100.0	0.008	100.0

\* By Molybdenite Corporation of Canada Ltd.

Test 2

A 1000 g sample of the mill tailing was floated using the following procedure.

TABLE 3  
Conditions and Reagents for Flotation

Operation	Reagents	lb/ton	Time min	pH
Conditioning	Na <sub>2</sub> SiO <sub>3</sub>	0.20	5	9.5
	Z-6	0.10		
Flotation	Pine oil	0.05	10	
	Dowfroth 250	0.05		

TABLE 4

Results of Flotation Test

Product	Weight %	Assays* % Bi	Distribution % Bi
Bi flot conc	3.2	0.22	50.2
Flot tail	96.8	0.007	49.8
Feed (calcd)	100.0	0.014	100.0

\* From Internal Report MS-AC-62-151, Jan. 3, 1963.

The concentrate obtained in this test was insufficient for a cleaning operation.

A screen and infrasizer size analysis run on the flotation tailing gave the following results.

TABLE 5

Size Analysis of Flotation Tailing

Size	Weight %	Assays* % Bi	Distribution % Bi
+35m	4.5	0.001	0.7
-35m+48m	9.7	0.002	3.1
-48m+65m	15.9	0.001	2.6
-65m+100m	14.8	0.001	2.5
-100m+150m	11.4	0.002	3.8
-150m+200m	9.3	0.002	3.1
-200m+50mu	5.5	0.006	5.5
-56mu+40mu	10.4	0.006	10.2
-40mu+28mu	6.4	0.008	8.4
-28mu+20mu	4.0	0.013	8.6
-20mu+10mu	4.3	0.023	16.3
-10mu	3.8	0.056	35.2
Flot tail (calcd)	100.0	0.006	100.0

\* By Molybdenite Corporation of Canada Ltd.

## CONCLUSIONS

The small sample of material received limited the investigation to one gravity concentration test and one flotation test.

The gravity concentration test recovered only 13.3% of the bismuth contained in the sample of mill tailing. A screen and infrasizer analysis carried out on the table tailing indicated that this low recovery was mainly due to the fine nature of the bismuth.

The flotation test, using pine oil, Dowfroth 250,  $\text{Na}_2\text{SiO}_3$ , and reagent Z-6, gave a 50.2% bismuth recovery. As all these reagents are used in the company's mill, it is possible that an increase in either reagent concentration or flotation time might improve the bismuth recovery.

The flowsheet of Molybdenite Corporation of Canada shows that sodium cyanide is added to the sump at the head of the flotation circuit. Test work at the Mines Branch on this type of ore indicates that cyanide has a definite depressing effect on bismuth, so that a reduction of the amount of this reagent added might improve the bismuth recovery. However, any reduction of sodium cyanide should be made gradually because it may cause an undesirable increase in the copper and iron sulphides contained in the final  $\text{MoS}_2$ -Bi concentrate.

Another possible means of improving the bismuth recovery would be to filter and wash the mill tailing to remove most of the sodium cyanide, and then refloat a bismuth scavenger concentrate. However, the amount of bismuth recovered may not be sufficient to warrant the additional costs involved in this treatment.