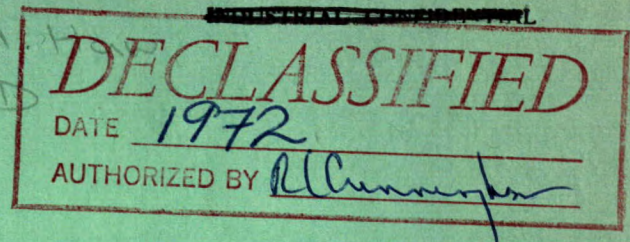


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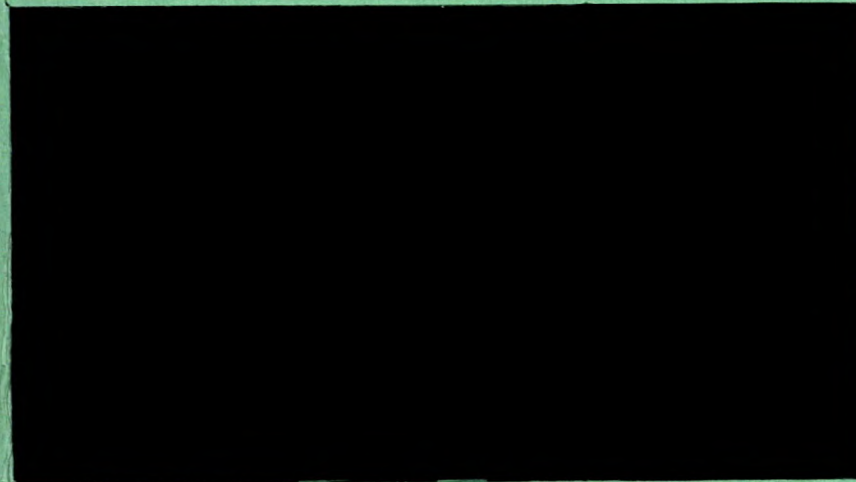
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IR 70-42

June, 1970

FLOTATION OF MOLYBDENITE FROM AN ORE  
FROM THE BATHURST AREA, NEW BRUNSWICK

by

T.F. Berry and R.W. Bruce

Mineral Processing Division

Note: This report relates essentially to the samples as received. The report and any correspondence connected therewith shall not be used in full or in part as publicity or advertising matter.

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Mines Branch Investigation Report IR 70-42

FLOTATION OF MOLYBDENITE FROM AN ORE  
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SUMMARY OF RESULTS

The ore sample assayed 1.97%  $\text{MoS}_2$  and was composed essentially of feldspar and quartz, in which were disseminated coarse aggregates of molybdenite.

At the relatively coarse grind of 32% minus 200 mesh, a high-grade molybdenite flotation concentrate was recovered assaying 98.00%  $\text{MoS}_2$  with a recovery in the final concentrate of 94.5% of the molybdenite.

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\*Technical Officer and \*\*Head, Non-Ferrous Minerals Section, Mineral Processing Division, Mines Branch, Department of Energy, Mines and Resources.

## INTRODUCTION

On September 26, 1969, Mr. J.W. McCarthy, P.O. Box 333, Bathurst, New Brunswick, asked the Mines Branch for assistance in developing a process for the recovery of molybdenite from an ore deposit recently acquired in the Bathurst area of New Brunswick.

### Shipment

On November 12, 1969, a steel drum containing approximately 300 lb of lump ore was received at the Mines Branch from Mr. McCarthy.

### Sampling and Analysis

After selecting several representative specimens of ore for a mineralogical examination, the entire shipment was crushed to minus  $\frac{1}{2}$  inch. Half of the ore was bagged at this size and the remainder was crushed to minus 10 mesh and riffled into 2000-gram test samples. One of these test samples was further reduced for a chemical and a semi-quantitative spectrochemical analysis. The results of chemical analysis of the head sample are shown in Table 1.

TABLE 1

#### Results of Chemical Analysis\*

Element	Per Cent
Molybdenite ( $\text{MoS}_2$ )	1.97
Copper (Cu)	0.004
Bismuth (Bi)	0.003
Insoluble	95.08

\*From Internal Report MS-AC-70-101.

The semi-quantitative spectrochemical analysis showed that, with the exception of molybdenum, no other elements were present in economic amounts.

## MINERALOGICAL EXAMINATION\*

A sample of the ore, consisting of two large hand specimens and about 100 grams of the head sample, was sent to the Mineralogy Section of the Mineral Sciences Division for microscopic examination to identify the minerals in the ore and determine their grain size and textural relationship.

The hand specimens were composed essentially of feldspar and quartz in which were disseminated coarse aggregates of molybdenite. Polished sections were prepared from the hand specimens and from the sink products of heavy liquid separations of the head sample. The float products from the head sample were run on an X-ray diffractometer to identify the major gangue minerals.

### Results of Examination

Microscopic examination of the polished sections showed that molybdenite is the only significant ore mineral in the sample. It occurs as very coarse sheaf-like aggregates disseminated throughout the gangue. These aggregates vary in size from 0.3 to 10 millimetres; most, however, are larger than 2 millimetres. The molybdenite is free of inclusions, except for a few thin grains of gangue, intercalated between the molybdenite plates.

The only other ore minerals found in the hand specimens consisted of a few grains of magnetite and some clusters of grains of associated rutile and anatase.

The sink product of the head sample, while consisting essentially of molybdenite and containing small amounts of the other above mentioned minerals, also contains a few grains of chalcopyrite, pyrite, ilmenite, sphalerite, galena, marcasite, goethite and hematite. The gangue minerals are composed largely of quartz and feldspar, with small amounts of mica and chlorite.

## DETAILS OF INVESTIGATION

### Preliminary Flotation (Tests 1, 2, 3, and 4)

The molybdenite appeared to break free of the host rock during coarse crushing and these four tests were designed to determine the degree of comminution necessary to ensure a maximum flotation recovery. In each of these tests, a 2000-gram sample of minus 10-mesh ore was ground to increasing fineness and was floated using kerosene, pine oil and Dowfroth 250. The operating conditions

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\*From Internal Report MS-7004 by D. Owens.

and the results obtained were as follows.

TABLE 2

Flotation Scheme (Tests 1, 2, 3 and 4)

Test No.	Operation	Time min	% -200 mesh	Reagents lb/ton ore		
				Kerosene	Pine oil	Dow 250
1	Grind	5	20.1			
2	"	10	34.3			
3	"	15	46.0			
4	"	20	57.3			
all	Conditioning	3		0.3		
all	Flotation	3			0.03	0.03

TABLE 3

Results of Flotation Tests 1, 2, 3 and 4

Test No.	Product	Weight %	Assays %*	Distribution %
			MoS <sub>2</sub>	MoS <sub>2</sub>
1	Final conc	2.2	88.01	96.1
	Flot tail	97.8	0.08	3.9
	Head (calcd)	100.0	2.01	100.0
2	Final conc	2.4	86.33	98.2
	Flot tail	97.6	0.04	1.8
	Head (calcd)	100.0	2.11	100.0
3	Final conc	2.7	77.06	97.7
	Flot tail	97.3	0.05	2.3
	Head (calcd)	100.0	2.13	100.0
4	Final conc	2.5	82.54	97.2
	Flot tail	97.5	0.06	2.8
	Head (calcd)	100.0	2.12	100.0

\*From Internal Report MS-AC-70-148.

Flotation (Test 5)

A 2000-gram sample of minus 10-mesh ore was ground to 32.2% minus 200 mesh and was floated for 4 minutes using the same reagents shown in Table 2. The rougher concentrate was cleaned for 3 minutes and recleaned for 2 minutes. The results were as shown in Table 4.

TABLE 4  
Results of Flotation (Test 5)

Product	Weight %	Assays %*	Distribution %
		MoS <sub>2</sub>	MoS <sub>2</sub>
Final conc	1.9	98.00	93.6
Recleaner tail	0.1	36.43	1.8
Cleaner tail	0.6	3.77	1.1
Flot tail	97.4	0.07	3.5
Head (calcd)	100.0	1.99	100.0

\*From Internal Report MS-AC-70-213.

Flotation (Test 6)

In this test a 2000-gram sample of the ore was ground to the same fineness as in Test 5. Half the amount of kerosene was used with one-half being added to the grind and the remainder to conditioning. Pine oil at a feed rate of 0.045 lb/ton was used in place of Dowfroth. The rougher concentrate was cleaned once for 2 minutes. The results are shown in Table 5.

TABLE 5  
Results of Flotation (Test 6)

Product	Weight %	Assays %*	Distribution %
		MoS <sub>2</sub>	MoS <sub>2</sub>
Final conc	1.9	98.00	94.5
Cleaner tail	0.8	3.90	1.6
Flot tail	97.3	0.08	3.9
Head (calcd)	100.0	1.97	100.0

\*From Internal Report MS-AC-70-213.

#### CONCLUSIONS

The results of the investigation showed that the molybdenite can be readily recovered by flotation at a coarse grind of 35 per cent minus 200 mesh.

Flotation with kerosene and pine oil as promoter and frother respectively, using one or two stages of cleaning, was successful in producing a high-grade concentrate assaying 98 per cent MoS<sub>2</sub> with a molybdenite recovery in the range of 95 per cent.

#### ACKNOWLEDGEMENTS

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Mr. D. Owens of the Mineralogy Section of the Mineral Sciences Division did the mineralogical work on the ore.

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