O T T A W A March 25th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1189.

Investigation on the Flotation Concentration of the Scheelite in Slime Table Tailings.

(Copy No. 26.)

BUREAU OF MINES
DIVISION OF METALLIC MINERALS
—
ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

O T T A W A March 25th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1189.

Investigation on the Flotation Concentration of the Scheelite in Slime Table Tailings.

Products:

Tests were conducted on the slime table tailings from the table concentration of the following scheelite ores:

McKenzie Red Lake Gold Mines Limited, McKenzie Island, Ontario.

Hollinger Consolidated Gold Mines Limited, Porcupine area, Ontario.

Preston East Dome Mines Limited, Porcupine area, Ontario.

Leitch Gold Mines Limited, Beardmore area, Ontario.

McIntyre Porcupine Mines Limited, Porcupine area, Ontario.

General Characteristics of the Slime Table Tailings:

The scheelite in the tailings occurred as fine particles, mostly free, but an appreciable amount was interlocked with the gangue.

The gangue minerals common in the tailings of the above ores were: quartz and carbonates. Small amounts of sulphides were present in the tailings.

Purpose of Investigation:

The purpose of the investigation was to determine the maximum possible recovery of scheelite in the slime table tailing.

Investigative Work:

The tests consisted of flotation of scheelite. A recovery of 90.1 per cent was obtained; the concentrate contained 11.63 per cent and the flotation tailing assayed 0.14 per cent WO_3.

Test Mill Runs.

General Flow-Sheet Used in Test Mill Runs:

The slime table tailing was thickened in a double-tray Dorr thickener. The overflow went to waste and the underflow was fed to a Hardinge ball mill in closed circuit with an 80-mesh Hummer screen. The screen undersize flowed to a conditioning tank and thence to a sulphide flotation circuit. The rougher sulphide concentrate was cleaned twice. The tailing from the first cleaner circuit was returned to the rougher flotation circuit and the second cleaner circuit tailing was returned to the first cleaner circuit.

The rougher sulphide flotation tailing was fed to a conditioning tank and thence to a scheelite flotation circuit. The rougher scheelite concentrate was cleaned four times. The

(General Flow-Sheet Used in Test Mill Runs, cont'd) -

tailing from each cleaner circuit was returned to the preceding circuit. The rougher scheelite tailing went to waste.

The feed rate to the ball mill was around 400 pounds of solids per hour.

Pulp Densities -	% Solids
Conditioning tank, sulphide flotation circuit	= 26 - 40
" " , scheelite " "	= 17 - 23
1st cleaner circuit, " "	= 20 - 36
2nd " " , " "	= 22 - 35

Temperatures of Scheelite Flotation Pulps -

Rougher circuit	-	75 - 95° F.
1st cleaner circuit	-	90 - 105° F.
2nd " "	-	100 - 110° F.
3rd " "	-	105 - 115° F.

Details of Typical Mill Run:

The following details will give an indication of some of the results obtained:

Reagent Consumption.		Lb./ton of flotation feed
Sulphide Flotation Circuit -		
Soda ash to conditioner	-	1.7
Water glass to conditioner	-	0.6
Reagent 301 " "	-	0.04
Pine oil " "	-	0.08
Scheelite Flotation Circuit -		
Oleic emulsion* to conditioner	-	0.45
Oleic acid " "	-	1.56
Quebracho extract, 1st cleaner circuit	-	0.20
" " , 2nd cleaner circuit	-	0.16
" " , 3rd cleaner circuit	-	0.08

pH of the sulphide circuit tailing solution: 8.7 - 9.9.
" " " scheelite " " " : 8.35 - 8.8.

The hardness of the scheelite flotation solution was 40.5 parts per million of $CaCO_3$.

---

* Oleic emulsion: 5% oleic acid, 5% emulsol X-1.

(Details of Typical Mill Run, cont'd) -

The solids in the overflow from the Dorr thickener were 5.8 per cent of the thickener feed and contained 4.90 per cent WO_3.

Results of Flotation:

	WO_3, per cent	Sulphide S, per cent	Au, oz./ton
Dorr thickener feed	= 1.44		
" " underflow (flot.feed)	= 1.27		
" " overflow (to waste)	= 4.90		
Pyrite flotation concentrate	= 2.04	9.01	1.79
Scheelite flotation concentrate	= 11.63		
Scheelite flotation tailing	= 0.14		0.02

Ratio of concentration: $\frac{11.63 - 0.14}{1.27 - 0.14} = 10.17.$

Scheelite Recovery: $\frac{11.63 \times 100}{10.17 \times 1.27} = 90.1$ per cent.

Screen Test on Scheelite Flotation Feed.

Mesh	Weight, per cent
+100	4.5
-100+150	16.2
-150+200	20.0
-200	59.3
	100.0

Microscopic observations of the scheelite flotation tailings showed interlocked particles of scheelite and gangue even when the size of particles was as low as 150 mesh. This would indicate that very fine grinding is necessary.

Conclusions:

A recovery of about 90 per cent of the scheelite in the slime table tailing (WO_3, 1.27 per cent) can be obtained by flotation. A concentrate was obtained which contained 11.63 per cent WO_3; the tailing assayed 0.14 per cent WO_3.

The slime table tailings were thickened in a double-tray Dorr thickener (4 ft. diam., 25 sq. ft. area). As this thickener is too small for the amount of pulp put into it, the overflow contained an appreciable amount of solids. With a thickener of larger area, the overflow loss should be reduced appreciably.

The temperature of the pulp in the scheelite flotation circuit was kept fairly high, as scheelite floats more readily in warm pulp. This is due to greater dispersion of oleic acid in the warm pulp.

The hardness of water in the scheelite flotation circuit should be kept quite low as hard water consumes an appreciable amount of oleic acid. Low hardness can be attained by addition of soda ash to the flotation pulp.

oooooooooooo
oooooo
oo

JFK:GHB.