

O T T A W A

August 13th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1283.

Recovery of Scheelite from the Mill Tailing
from International Tungstens, Limited (formerly
known as the Slave Lake Gold Mines Limited),
Outpost Island, Northwest Territories.

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from International Tungstens, Limited (formerly
known as the Slave Lake Gold Mines Limited),
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Shipment:

A shipment of 100 pounds of mill tailing was received on June 29th, 1942. The shipment was submitted by W. W. Davis, President, International Tungstens, Limited, Canada Permanent Building, Toronto, Ontario.

Major Bernhard Day, Consulting Engineer, 804 Atlas Building, 350 Bay Street, Toronto, Ontario, as consulting engineer for International Tungstens, Limited, is conducting the investigation for the recovery of the tungsten-bearing minerals from the ore.

Location of the Property:

The property is located on Outpost Island, Great Slave Lake, Northwest Territories.

Purpose of the Investigation:

The investigation was made to determine what recovery of scheelite could be made from a cyanide tailing; also, the result of cyaniding the present flotation tailing.

Character of the Shipment:

The shipment consisted of a quantity of flotation tailing. A screen analysis of the head sample showed it to be ground 41 per cent minus 200 mesh. Some sulphides were observed in the tailing.

Sampling and Analysis:

The shipment was sampled by standard methods and was found to contain:

Gold (Au)	-	0.27 oz./ton
Copper (Cu)	-	0.20 per cent
Tungsten trioxide (WO ₃)	-	0.69 "

Investigative Procedure:

Samples of the tailing, as received, were treated by cyanidation without regrinding.

The cyanide tailings were concentrated by flotation, first to remove the sulphides and then to recover a scheelite concentrate.

A screen analysis was made on the head sample of the shipment.

Results of Tests:

94 per cent of the scheelite reported in the minus 200 mesh portion of the feed.

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(Results of Tests, cont'd) -

70 per cent of the contained gold was extracted by cyanidation; due to the incomplete removal of copper from the mill tailing, there was an excessive consumption of cyanide.

The sulphide concentrate assayed 1.44 ounces of gold per ton, 5.34 per cent copper, and 0.23 per cent WO_3 . The scheelite concentrate assayed 17.8 per cent WO_3 .

Details of Tests:

Test No. 1. - Screen Analysis.

A portion of the head sample was screened on various screens and the products were assayed for gold and WO_3 .

Results:

Products	Weight:		Assays		Distribution,	
	per cent	oz./ton	Au, oz./ton	WO_3 , per cent	Au per cent	WO_3 per cent
Feed	100.0	0.29	0.72		100.00	100.00
+ 65 mesh	2.7	0.23	0.03		2.17	0.11
- 65 +100 mesh	11.6	0.19	0.12		7.70	1.93
-100 +150 mesh	26.0	0.204	0.03		18.54	1.08
-150 +200 mesh	18.7	0.24	0.11		15.69	2.86
-200 mesh	41.0	0.39	1.65		55.90	94.02

It was observed that 94 per cent of the WO_3 reported in the minus 200 mesh portion of the feed.

Test No. 2.- Cyanidation of Flotation Tailing.

Samples of the mill tailing, as received, were agitated in cyanide solution, 1.0 pound NaCN per ton, for 24 hours at a dilution of 1:1 $\frac{1}{2}$. Lime was used to give the solutions protective alkalinity.

The cyanide tailings were filtered and washed by means of spray similar to that used on the Oliver filter. This was done to duplicate mill practice as closely as possible in a small-scale test.

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(Test No. 2, cont'd) -

The tailing was sampled and then concentrated by flotation to determine the recovery and grade of WO_3 concentrate.

Results of Cyanidation:

Test no.	Assays, Au oz./ton		Extraction, per cent	Final titration, lb./ton solution		Reagents consumed, lb./ton of ore	
	Feed	Tailing		NaCN	CaO	NaCN	CaO
2-A	0.27	0.08	70.4	0.44	0.40	2.86	3.44
2-B	0.27	0.08	70.4	0.60	0.50	4.29	3.40

The reducing power of the cyanide solution was 320 ml. N/10 $KMnO_4$ per litre.

The copper sulphides remaining in the cyanide feed react as cyanicides and cause abnormal consumption of cyanide in these tests.

Test No. 3. - Flotation of Scheelite from the Cyanide Tailing.

The cyanide tailing was repulped in a flotation machine and conditioned for 10 minutes with 1.0 pound of soda ash and 1.0 pound of copper sulphate per ton, pH 8.5. Then 0.15 pound of butyl xanthate and 0.10 pound of cresylic acid per ton were added and a sulphide concentrate was recovered which was recleaned without reagents.

Scheelite Flotation -

1.0 pound of water glass per ton was added to the pulp and conditioned for 10 minutes.

The reagents to WO_3 float included:

Emulsol X-1	-	0.06 lb./ton
P. and G. Orso	-	0.10 "
Cresylic acid	-	None.

The WO_3 concentrate was recovered in 2 minutes.

A scavenger concentrate was recovered by the following additions to the pulp:

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(Test No. 3, cont'd) -

Emulsol X-1	-	0.1 lb./ton	
P. and G. Orso	-	0.25 "	; added in stages.
Cresylic acid	-	None.	

The scavenger concentrate was recovered in 10 minutes.

Results:

Products	Weight, : per : cent :	WO ₃ : Assays, : per cent :	Distribution, : of WO ₃ , : per cent :	Ratio of concent- ration.
Feed	:100.00	0.68	100.00	
Sulphide conc.	: 1.55	0.23	0.53	64.5:1.
" cleaner	:			
tailing	: 0.59	1.70	1.48	169.5:1.
WO ₃ conc.	: 1.82	17.82	47.83	54.9:1.
Scavenger conc.	: 4.18	6.16	37.97	23.9:1.
Flotation tailing	: 91.86	0.09	12.19	

The sulphide concentrate assayed:

Gold (Au)	-	1.44 oz./ton
Copper (Cu)	-	5.34 per cent.

Conclusions:

The results of the investigation indicate that an acceptable grade of concentrate for chemical treatment can be recovered from material similar to that submitted in the shipment.

In practice, the scavenger concentrate would be returned to the scheelite flotation feed. The grade of the concentrate is then determined by controlling the reagents to give a maximum recovery with a minimum tailing. The amounts of the various reagents required can best be determined under conditions of a continuous operation.

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