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O T T A W A  July 24th, 1942.

# R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1269.

## Recovery of Scheelite from the Jig Concentrates from the McMarmac Red Lake Gold Mines Limited, McKenzie Island, Ontario.

(Copy No. 13.)

BUREAU OF MINES
DIVISION OF METALLIC MINERALS

ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Shipment:

A shipment of 230 pounds of jig and blanket-table concentrates was received on June 23rd, 1942. It was submitted by J. E. Bryans, Mill Superintendent, McMarmac Red Lake Gold Mines Limited, McKenzie Island, Ontario.

Location of Property:

The property is located on McKenzie Island, Red Lake, Ontario.

Character of the Ore:

The sample of concentrates varied from coarse to fine and contained an appreciable amount of metallic iron, some magnetite, and various sulphides.

A screen analysis shows a fairly uniform distribution of scheelite from plus 35 mesh to plus 150 mesh. The minus 150 mesh portion contained approximately 10 per cent of the total tungsten trioxide.

Investigative Procedure:

The concentrates were treated by magnetic separation to remove the metallic iron and this was followed by flotation. The recovery of the scheelite was determined as a scheelite flotation concentrate and as a residue by removing the sulphide portion.

Results of Test Work:

After removing the sulphides the flotation tailing assayed 17.34 per cent $WO_3$.

Removing the magnetic portion of the flotation tailing raised the grade to 29.16 per cent $WO_3$.

A scheelite concentrate recovered by flotation assayed 37.57 per cent $WO_3$, with a recovery of 39.8 per cent.

Sampling and Analysis:

A representative portion of the sample was assayed and was found to contain:

| | | |
|---|---|---|
| Gold | = | 7.885 oz./ton. |
| Tungsten trioxide | = | 11.59 per cent. |

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(Sampling and Analysis, cont'd) -

Screen Analysis.

| Product, mesh | Weight, per cent | $WO_3$ assay, per cent | Distribution of $WO_3$, per cent |
|---|---|---|---|
| + 35 | 4.68 | 36.04 | 14.55 |
| - 35+ 48 | 8.46 | 26.87 | 19.61 |
| - 48+ 65 | 14.13 | 19.35 | 23.59 |
| - 65+100 | 16.82 | 13.12 | 19.04 |
| -100+150 | 25.07 | 5.91 | 12.78 |
| -150+200 | 16.76 | 3.41 | 4.93 |
| -200 | 14.08 | 4.52 | 5.50 |
| Feed | 100.00 | 11.59 | 100.00 |

Details of Tests:

Test No. 1. - Flotation followed by Magnetic Separation of the Magnetic Portion of the Flotation Tailing.

A portion of the concentrate was ground approximately 60 per cent minus 200 mesh without reagents.

Sulphide Flotation.

Reagents:

| | | Lb./ton |
|---|---|---|
| Sulphuric acid (To give pH 5.5 - 6.0) | | 15.0 |
| Amyl xanthate | - | 0.4 |
| Cresylic acid | - | 0.35 |
| Pine oil | - | 0.06 |

The sulphides were activated by the sulphuric acid and the amyl xanthate was added in stages as required. When no further sulphides could be seen the flotation was discontinued. The pH of the pulp at the end was 6.0.

A portion of the flotation tailing was passed through a Davis tube magnetic separator to remove the magnetic portion of the tailing.

The non-magnetic tailing was designated Scheelite

(Test No. 1, cont'd) -

Concentrate.

Results of Sulphide Flotation.

| Products | Weight, per cent | $WO_3$ assay, per cent | Distribution of $WO_3$, per cent | Ratio of concentration |
|---|---|---|---|---|
| Feed | 100.0 | 11.59 | 100.00 | |
| Flot. concentrate | 35.7 | 1.24 | 3.82 | 2.8:1. |
| Flot. tailing | 64.3 | 17.34 | 96.18 | |

The flotation concentrate contained 15.36 ounces gold per ton.

In practice, the flotation feed would have been barrel-amalgamated to remove free gold. The grade of the tailing is acceptable for chemical treatment.

Results of Iron Separation.

| Products | Weight, per cent: In test | Weight, per cent: In orig. feed | $WO_3$ assay, per cent | Distribution of $WO_3$, per cent: In % test | Distribution of $WO_3$, per cent: In orig. feed | Ratio of concentration |
|---|---|---|---|---|---|---|
| Feed - flot. tailing | 100.0 | 64.3 | 17.34 | 100.00 | 96.18 | |
| Mag. concentrate | 40.6 | 26.1 | 0.06 | 0.14 | 0.14 | 2.46:1. |
| Non-mag. tailing $WO_3$ concentrate | 59.4 | 38.2 | 29.16 | 99.86 | 96.04 | |

In this test the removal of the magnetic portion of the tailing raised the grade to 29.16 per cent $WO_3$.

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Test No. 2. - Flotation of Scheelite.

In this test the magnetic portion of the feed was removed prior to grinding.

The non-magnetic portion was ground in a ball mill to give a product approximately 70 per cent minus 200 mesh.

(Continued on next page)

(Test No. 2, cont'd) -

| Reagents to Ball Mill: | | Lb./ton. |
|---|---|---|
| Soda ash | = | 0.5 |
| Amyl xanthate | = | 0.1 |
| Cresylic acid | = | 0.1 |

A pyrite concentrate was floated in about 5 minutes.

Additional Reagents to Sulphide Flotation:

| | | | |
|---|---|---|---|
| Soda ash | = | 1.5 | pH 8.9 |
| Amyl xanthate | = | 0.1 | |
| Cresylic acid | = | 0.1 | |

A further amount of black sulphide concentrate was recovered in about 3 minutes, probably arsenopyrite, designated Sulphide Concentrate No. 2.

Reagents to Scheelite Flotation:

| | | |
|---|---|---|
| Water glass (Sodium silicate) | = | 1.0 -10 min. agitation. |
| Emulsol X-1 | = | 0.05 |
| Orso | = | 0.05 |

No frother was required. pH, 8.2.

A scheelite concentrate was recovered in 2½ minutes.

Reagents to Scavenger Scheelite Concentrate:

| | | |
|---|---|---|
| Emulsol X-1 | = | 0.05 |
| Orso | = | 0.15 |

The scavenger concentrate required 8 minutes.

In practice the scavenger concentrate is returned directly to the scheelite flotation feed.

It was noted in the test that nearly all the remaining solids were removed by flotation of scheelite.

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(Test No. 2, cont'd) -

Results:

| Products | Weight, per cent | Assays Au, oz./ton | Assays $WO_3$, per cent | Distribution, per cent Au | Distribution, per cent $WO_3$ | Ratio of concentration |
|---|---|---|---|---|---|---|
| Feed* | 100.00 | 6.61 | 9.02 | 100.00 | 100.00 | |
| Magnetic conc. | 48.12 | 4.44 | 5.11 | 32.33 | 27.25 | 2.1:1. |
| Sulphide Conc. No. 1 | 21.60 | 15.42 | 0.90 | 50.41 | 2.15 | 4.6:1. |
| " " No. 2 | 3.36 | 28.32 | 4.58 | 14.40 | 1.71 | 29.8:1. |
| $WO_3$ concentrate | 9.55 | 0.90 | 37.57 | 1.30 | 39.76 | 10.5:1. |
| Scavenger concentrate | 15.24 | 0.36 | 16.46 | 0.83 | 27.80 | 6.6:1. |
| Flotation tailing | 2.13 | 2.25 | 5.65 | 0.73 | 1.33 | |
| Combined sulphide concentrates* | 24.96 | 17.16 | 1.40 | 64.81 | 3.86 | 4.0:1. |
| Combined $WO_3$ and scavenger concs.* | 24.79 | 0.57 | 24.59 | 2.13 | 67.56 | 4.0:1. |
| Combined $WO_3$, scavenger and magnetic concs.* | 72.91 | 3.12 | 11.73 | 34.46 | 94.81 | 1.4:1. |
| Residue left after floating sulphides* | 75.04 | 3.10 | 11.56 | 35.19 | 96.14 | |

* Calculated values.

94.8 per cent of the tungsten trioxide reported in the combined magnetic, $WO_3$, and scavenger concentrates.

96.14 per cent of the tungsten trioxide reported in the flotation tailing after floating the sulphides, and the tailing assayed 11.56 per cent $WO_3$.

Summary and Conclusions:

The material submitted for the investigation was the concentrates recovered by a mineral jig and blanket tables. It is obvious that this method recovers only the heavier particles of scheelite. The slimed scheelite will report in the blanket tailing and be lost in the mill tailings.

The investigation indicated that when the sulphides were floated, the flotation tailing remaining assayed 11.56 per cent $WO_3$ and contained 96.1 per cent of the $WO_3$ in the feed.

The removal of the magnetics would result in a higher grade product and a corresponding decrease in shipment charges.

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