

O T T A W A

August 13th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1232.

Deister Table Concentrate from the Sand  
River Mine of the Magnet Consolidated Mines Limited,  
Beardmore Area, Thunder Bay District, Ontario.

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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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Beardmore Area, Thunder Bay District, Ontario.

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Shipment:

A shipment of 50 pounds of Deister table concentrate was received on May 11th, 1942. The shipment was submitted by W. S. Hargraft, Metallurgist, Magnet Consolidated Mines Limited, Geraldton, Ontario.

Location of the Property:

The property of the Sand River Gold Mining Company Limited, from which this shipment was received, is located in Eva and Summers townships, Beardmore area, in the Thunder Bay district of Ontario.

Purpose of the Investigation:

The investigation was made to determine whether the scheelite content could be recovered by flotation.

Sampling and Analysis:

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

|                                      |   |               |
|--------------------------------------|---|---------------|
| Gold (Au)                            | - | 0.23 oz./ton  |
| Tungsten trioxide (WO <sub>3</sub> ) | - | 0.20 per cent |
| Sulphur (S)                          | - | 3.21 "        |
| Arsenic (As)                         | - | 0.72 "        |
| Phosphorus (P)                       | - | 0.07 "        |
| Insoluble                            | - | 75.60 "       |

Investigative Procedure:

The concentrate was treated by flotation with various reagents without regrinding. A screen analysis of the head sample was made.

Results of Test Work:

A sulphide concentrate was recovered which contained 67 per cent of the gold and assayed 1.74 ounces gold per ton.

A WO<sub>3</sub> concentrate was recovered which contained 31.3 per cent of the WO<sub>3</sub> and assayed 9.2 per cent WO<sub>3</sub>. The scavenger concentrate recovered 19.4 per cent of WO<sub>3</sub>. The flotation tailing assayed 0.08 ounce of gold per ton and 0.15 per cent of WO<sub>3</sub>.

A lower grade scheelite concentrate was made which contained 54.3 per cent of the WO<sub>3</sub> and assayed 5.8 per cent WO<sub>3</sub>. The scavenger concentrate contained 40.5 per cent of

(Results of Test Work, cont'd) -

the  $WO_3$  and assayed 1.08 per cent  $WO_3$ . The tailing from this test assayed 0.02 per cent  $WO_3$ .

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

Details of the Tests:

Test No. 1. - Screen Analysis.

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

Results:

| <u>Mesh</u> | <u>Weight,</u> | <u><math>WO_3</math></u> | <u>Distribution of</u>    |
|-------------|----------------|--------------------------|---------------------------|
| <u>No.</u>  | <u>per</u>     | <u>assay,</u>            | <u><math>WO_3</math>,</u> |
|             | <u>cent</u>    | <u>per cent</u>          | <u>per cent</u>           |
| + 65        | 13.8           | 0.03                     | 3.44                      |
| +100        | 10.9           | 0.07                     | 2.38                      |
| +150        | 19.9           | 0.01                     | 0.62                      |
| +200        | 18.6           | 0.11                     | 6.38                      |
| -200        | 36.8           | 0.76                     | 87.18                     |
|             | 100.0          | 0.32                     | 100.00                    |

The results indicate that about 93.5 per cent of the  $WO_3$  is in the minus 150 mesh portion of the feed.

Test No. 2. - Flotation.

A portion of the concentrate was conditioned in a flotation machine for 10 minutes, at a dilution of about 22 per cent solids with 0.70 pound of soda ash and 0.50 pound of copper sulphate per ton. pH, 9.2.

To float sulphide the following reagents were added:

(Continued on next page)

(Test No. 2, cont'd) -

|                         | <u>Lb./ton</u> |
|-------------------------|----------------|
| Aerofloat 242           | - 0.075        |
| Potassium amyl xanthate | - 0.20         |
| Frother B23             | - 0.10         |

Sulphide Concentrate.

WO<sub>3</sub> Flotation -

|                               |         |
|-------------------------------|---------|
| Water glass (sodium silicate) | - 1.0   |
| Emulsol X-1                   | - 0.1   |
| P. and G. 'Orso'              | - 0.30  |
| B23                           | - 0.20  |
| Cresylic acid                 | - 0.075 |

The WO<sub>3</sub> concentrate was recovered in 2 minutes and a scavenger concentrate in about 8 minutes.

Results:

| Product           | Weight, : |         | Assays   |                   | Distribution, : |                 | Ratio of |
|-------------------|-----------|---------|----------|-------------------|-----------------|-----------------|----------|
|                   | per       | cent    | Au,      | WO <sub>3</sub> , | per cent        | concentration   |          |
|                   | cent      | oz./ton | per cent | per cent          | Au              | WO <sub>3</sub> |          |
| Feed              | :100.00   | : 0.23  | : 0.24   | :100.0            | :100.0          | :               | :        |
| Sulphide conc.    | : 8.88    | : 1.74  | : 0.05   | : 67.2            | : 1.8           | : 11.3:1.       | :        |
| WO <sub>3</sub> " | : 0.82)   | : 0.16  | : 9.19)  | : 2.2             | : 31.5          | :122.0:1.       | :        |
| Scavenger "       | : 2.27)   | :       | : 2.06)  | :                 | : 19.4          | : 44.1:1.       | :        |
| Flot. tailing     | : 88.03   | : 0.08  | : 0.13   | : 30.6            | : 47.5          | :               | :        |

Test No. 3. - Flotation.

A similar test was made in an attempt to raise the grade of WO<sub>3</sub> concentrate.

Reagents:

| To Conditioner - | <u>Lb./ton</u> |
|------------------|----------------|
| Soda ash         | - 0.70         |
| Copper sulphate  | - 0.50         |

Agitation time, 10 minutes.

Sulphide Flotation -

|                         |        |
|-------------------------|--------|
| Aerofloat               | - 0.15 |
| Potassium amyl xanthate | - 0.24 |
| B23                     | - 0.05 |

Sulphide Concentrate.

(Continued on next page)

(Test No. 3, cont'd) -

WO<sub>3</sub> Flotation -

|  | <u>Lb./ton</u> |
|--|----------------|
| Water glass<br>(conditioned 10 minutes), | - 1.0          |
| Emulsol X-1                              | - 0.20         |
| Orso                                     | - 0.20         |
| Cresylic acid,                           | - None.        |

Flotation time, 2 minutes.

Scavenger Flotation -

Add Orso, 0.30 pound per ton and  
float 8 minutes.

Results:

| <u>Product</u>        | <u>Weight, :</u> | <u>WO<sub>3</sub> :</u> | <u>Distribution :</u>       | <u>Ratio of</u> |
|-----------------------|------------------|-------------------------|-----------------------------|-----------------|
|                       | <u>per :</u>     | <u>assay, :</u>         | <u>of WO<sub>3</sub>, :</u> | <u>concen-</u>  |
|                       | <u>cent :</u>    | <u>per cent :</u>       | <u>per cent :</u>           | <u>tration</u>  |
| Feed                  | : 100.00         | : 0.32                  | : 100.00                    | :               |
| Sulphide conc.        | : 6.90           | : 0.01                  | : 0.21                      | : 14.5:1.       |
| WO <sub>3</sub> conc. | : 2.97           | : 5.83                  | : 54.34                     | : 33.7:1.       |
| Scavenger conc.       | : 11.96          | : 1.08                  | : 40.54                     | : 8.4:1.        |
| Flot. tailing         | : 78.17          | : 0.02                  | : 4.91                      | :               |

Test No. 4. - Flotation.

Test No. 3 was repeated with variations in reagents  
and amounts used.

Reagents:

| <u>To Conditioner -</u> | <u>Lb./ton</u> |
|-------------------------|----------------|
| Soda ash                | - 2.0          |
| Copper sulphate         | - 1.0          |

Agitation time, 10 minutes. pH, 9.2.

Sulphide Flotation -

|                             |        |
|-----------------------------|--------|
| Butyl xanthate. (in stages) | - 0.40 |
| Cresylic acid               | - 0.20 |

Sulphide Concentrate.

(Continued on next page)

(Test No. 4, cont'd) -

WO<sub>3</sub> Flotation -

|   | <u>Lb./ton</u> |
|---|----------------|
| Water glass,<br>(conditioned 10 minutes), - | 2.0            |
| Emulsol X-1 -                               | 0.14           |
| Orso -                                      | 0.10           |
| Cresylic acid -                             | None.          |

Flotation time, 2 minutes.

WO<sub>3</sub> Concentrate.

Scavenger Flotation -

|                 |      |
|-----------------|------|
| Emulsol X-1 -   | 0.02 |
| Orso -          | 0.30 |
| Cresylic acid - | 0.10 |

Flotation time, 10 minutes.

Results:

| Product           | Weight, per cent | WO <sub>3</sub> assay, per cent | Distribution of WO <sub>3</sub> , per cent | Ratio of concentration |
|-------------------|------------------|---------------------------------|--|------------------------|
| Feed              | 100.00           | 0.23                            | 100.00                                     |                        |
| Sulphide conc.    | 9.41             | 0.09                            | 3.76                                       | 10.6:1.                |
| WO <sub>3</sub> " | 1.42             | 7.37                            | 46.45                                      | 70.4:1.                |
| Scavenger "       | 2.37             | 4.00                            | 42.08                                      | 42.2:1.                |
| Flot. tailing     | 36.80            | 0.02                            | 7.71                                       |                        |

Summary and Conclusions:

It was observed that more soda ash was required to give alkalinity in later tests, indicating that the material was becoming oxidized.

The investigation indicates that a grade of concentrate of from 6 to 9 per cent WO<sub>3</sub> can be recovered. It was observed that a low-grade concentrate resulted in a higher overall recovery of scheelite. A high-grade concentrate resulted in a lower recovery.

In a continuous operation the grade and recovery are balanced by taking off the scheelite flotation concentrate and returning the scavenger concentrate to the scheelite

(Summary and Conclusions, cont'd) -

flotation feed, to recover a maximum amount of scheelite of suitable grade for chemical treatment. The grade of concentrate is determined by suitable control of the various reagents, which can best be ascertained during a continuous run.

The investigation indicates that an acceptable grade of concentrate for chemical treatment can be recovered from material similar to that submitted in the shipment from the property of the Sand River Gold Mining Company Limited.

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