O T T A W A June 26th, 1940.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 859.

Scheelite-Stibnite Ore from the
Bridge River Area, British Columbia.

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 June 26th, 1940.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 859.

Scheelite-Stibnite Ore from the Bridge River Area, British Columbia.

Shipment:

One drum of scheelite-stibnite ore, net weight 170 pounds, was received on January 30th, 1940, from the Bridge River area of British Columbia. The shipment was submitted by Edwin Phillips, Minto Mines P. O., British Columbia.

Characteristics of the Ore:

Six polished sections were prepared and examined microscopically for the purpose of determining the character of the ore.

Gangue -

The gangue consists of an assemblage of dark rock silicates, small masses and narrow veinlets of a white to brownish coloured scheelite, and fine disseminated carbonate. A microchemical test of the latter gave a very slight reaction for iron. In one section, which carries the bulk of the stibnite, the gangue appears to be largely quartz, and this mineral is probably scattered through other portions of the ore as well. Another section displays two or three small patches of a bright green coloured carbonate mineral.

Metallic Minerals -

The metallic mineral content of the sections is small and is represented almost exclusively by stibnite. This mineral is unevenly distributed as coarse to fine irregular grains and small crystalline masses which contain numerous inclusions of gangue. A very small amount of pyrite is present as rare, tiny, disseminated grains.

Moderately fine grinding may be necessary in order to free a small percentage of finely divided stibnite.

Sampling and Assaying:

The ore was crushed to minus 14 mesh and sampled by the standard method. The assays were as follows:

Tungsten (WO_3)	-	22.69 per cent
Antimony	-	0.59 "
Nickel	-	0.04 "
Copper	-	None.

Object of the Investigation:

The object of the investigation was to remove the stibnite (antimony mineral) by flotation in order to obtain, by tabling, a tungsten concentrate which would be low in antimony.

Results of the Investigation:

The results of the investigation show that the stibnite in the ore can be removed by flotation. A removal of 79.7 per cent of the antimony (Test No. 4) was obtained by using sodium silicate as a conditioning agent, Barrett No. 4 oil as a frother, copper sulphate as activator for stibnite, and Reagent 301 as collector.

The scheelite in the flotation tailing was concentrated by tabling. Concentrates were obtained which contained from 60 to 66 per cent of the tungsten and analysed from 74 to 76 per cent WO_3, less than 0.10 per cent antimony, and Nil phosphorus. An appreciable loss of tungsten was in the fine product. The ratio of concentration was from 4.8 to 5.5 into 1. From 21 to 26 per cent of the tungsten was in the table tailing from concentration of minus 150 mesh

products.

Practically the same recoveries of tungsten were obtained by tabling the flotation tailing and cleaning the middling products and table slimes by re-tabling (Test No. 2) as were obtained by tabling the sized products (Tests Nos. 1, 3, and 4).

Details of Experimental Tests:

FLOTATION AND TABLING.

Test No. 1.

A sample of ore was ground to about 85 per cent minus 100 mesh with the following reagents added: sodium silicate, 1.0; copper sulphate, 1.0; and Aerofloat No. 239, 0.22 pound per ton of ore. To the flotation cell the following reagents were added: potassium amyl xanthate, 0.15; and 0.093 pound per ton. This floated the stibnite.

The flotation tailing was filtered, dried, and screened. The screen-size distributions were as follows:

Mesh	Weight, per cent
+ 48	0.9
- 48 + 65	2.9
- 65 +100	10.3
-100	85.9
	100.0

The plus 48 and plus 65 mesh products contained

(Test No. 1, cont'd) -

a very small amount of scheelite.

Each sized product was concentrated by passing over a Wilfley table.

Results:

Product	Weight, per cent	Assays, per cent WO_3	Assays, per cent Antimony	Distribution, per cent WO_3	Distribution, per cent Antimony
Feed	100.00	22.07	0.64	100.0	100.0
Flot. conc.	1.60	9.42	23.17	0.7	57.7
Table conc.	19.30	76.38	0.27	66.8	8.1
Table middling	7.22	9.61	0.55	3.1	6.2
Table tailing	71.88	9.01	0.25	29.4	28.0

The ratio of concentration by tabling was 5.18 into 1.

-

Test No. 2.

The scheelite grinds to a high degree of fineness very readily. To prevent excessive sliming, a sample of ore was deslimed by decantation with water. The sands were ground with the following reagents:

Sodium silicate	-	1.0 lb./ton of ore
Sodium sulphide ($Na_2S.9H_2O$)	-	1.0 " " "
Barrett No. 4 oil	-	0.44 " " "

The ground sands and the decanted slimes were combined for flotation treatment. The following reagents were added to the cell:

Copper sulphate	-	1.5 lb./ton of ore
Reagent 301	-	0.30 " " "

Stibnite floated quite readily.

The flotation tailing was concentrated by tabling, giving four products, namely: concentrate, 1st middling, 2nd middling, and slimes. The 1st middling was put over the Wilfley table; this gave a

(Test No. 2, cont'd) -

concentrate, a middling, and a tailing. The 2nd middling and the slime were also passed over the table, giving middling and tailing products.

Results:

Product	Weight, per cent	WO_3, per cent: Assay	WO_3, per cent: Distribution	Antimony, per cent	Phosphorus, per cent
Feed	100.00	22.45	100.0		
Flot. conc.	3.53	14.18	2.2		
Table conc.	18.32	74.08	60.5	0.03	Nil
Table middling	8.36	25.81	9.6		
Table tailing	69.79	8.91	27.7		

The ratio of concentration by tabling was 5.46 into 1.

-

Test No. 3.

A sample of ore was deslimed by decantation with water and the sands were ground with the following reagents:

Sodium silicate,	- 1.0	lb./ton of ore
Sodium sulphide ($Na_2S.9H_2O$)	- 1.0	" " "
Barrett No. 4 oil	- 0.44	" " "

The ground sands and the decanted slimes were combined for flotation of stibnite.

Reagents added to flotation cell:

Copper sulphate	- 1.5	lb./ton of ore
Reagent 301	- 0.2	" " "

The flotation tailing was filtered, dried, and screened for table concentration.

Screen size distribution	Per cent
+ 65 mesh	3.5
- 65 +100 "	10.9
-100 +150 "	16.0
-150 "	69.6
	100.0

(Continued on next page)

(Test No. 3, cont'd) -

Each sized product was concentrated by tabling.

Results:

Product	Weight, per cent	Assays, per cent		Distribution, per cent	
		WO_3	Antimony	WO_3	Antimony
Feed	100.00	22.35	0.63	100.0	100.0
Flot. conc.	3.01	16.74	17.38	2.3	82.7
Table conc.	18.09	76.25	0.08	61.7	2.3
Table middling	11.08	18.95	0.08	9.4	1.4
Table tailing	22.39	0.44	0.16	0.4	5.7
Table slime*	45.43	12.89	0.11	26.2	7.9

* Table tailing from concentration of minus 150 mesh product.

The ratio of concentration by tabling was 5.53 into 1.

Test No. 4.

A sample of ore was deslimed by decantation, and the sands were ground with the following reagents:

Sodium silicate - 1.0 lb./ton of ore
Barrett No. 4 oil - 0.44 " " "

The ground sands and the decanted slimes were combined for the flotation of stibnite.

Reagents added to flotation cell:

Copper sulphate - 1.5 lb./ton of ore
Reagent 301 - 0.2 " " "

The flotation tailing was filtered, dried and screened for table concentration.

Screen size distribution		Per cent
+ 65 mesh	-	6.3
- 65 +100 "	-	11.2
-100 +150 "	-	11.2
-150 "	-	71.3
		100.0

(Continued on next page)

(Test No. 4, cont'd) -

Each sized product was concentrated by tabling.

Results:

Product	Weight, per cent	Assays, per cent		Distribution, per cent	
		WO_3	Antimony	WO_3	Antimony
Feed	100.00	23.75	0.73	100.0	100.0
Flot. conc.	2.20	14.65	26.40	1.4	79.7
Table conc.	20.81	76.11	0.05	66.7	1.4
Table middling	16.55	13.94	0.15	9.7	3.5
Table tailing	17.08	0.75	0.15	0.5	3.5
Table slime*	43.36	11.82	0.20	21.7	11.9

* Table tailing from concentration of minus 150 mesh product.

The ratio of concentration by tabling was 4.80 into 1.

Conclusions:

The results of the investigation show that the antimony can be eliminated by flotation and scheelite concentrate can be produced which will meet specifications demanded by buyers.

In actual milling practice the ore would not be treated as described in the test reports because grinding to free the stibnite for separation by flotation would cause excessive sliming of the scheelite, resulting in the high losses indicated by the tests made. To prevent these losses, the ore would be crushed only to a degree sufficient to free the scheelite which would then be concentrated in jigs and tables. The concentrate resulting from the gravity concentration

of ore would be a high-grade scheelite concentrate but contain too high a content of stibnite. To eliminate this stibnite the concentrate would be ground and then treated by flotation, a stibnite concentrate being produced together with a clean scheelite product. The latter would be obtained as a flotation tailing, which would then be caught in thickeners, filtered, and dried for the market.

oooooooo
oooo
oo

JFK:PES.