O T T A W A August 5th, 1941.

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of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1059.

Sink-and-Float Tests on a Sample of Silver-Lead-Zinc Ore from the Silversmith Mine at Sandon, British Columbia.

BUREAU OF MINES
DIVISION OF METALLIC MINERALS
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CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Shipment:

A sample of ore, weighing 100 pounds, was received on November 22nd, 1940. The sample was submitted by B. P. von Andersen, Treasurer, Silversmith Mines Limited, 916 American Building, Seattle, Washington, U. S. A.

Location of Property:

The property from which this ore was taken is located at Sandon in the Slocan district of British Columbia.

Character of the Ore:

Six polished sections were prepared and examined under the reflecting microscope for the purpose of determining the character of the ore.

Gangue -

Gangue is much more abundantly represented than in the previous sample (see Report M-773-E, Nov. 14th, 1940) and preponderates over metallics in the polished sections. It consists of a mixture of milky-white quartz and siliceous, dark grey rock with abundant, disseminated carbonate, coarse to fine in size. The rocky portions appear to be angular or sub-angular fragments and may represent a breccia. Much of the carbonate is light brown in colour and gives a rather strong microchemical test for iron.

Metallic Minerals -

In their approximate order of abundance, metallic minerals present in the polished sections are: sphalerite, galena, arsenopyrite, pyrite, chalcopyrite, pyrrhotite, and tetrahedrite.

Sphalerite predominates largely as small masses which enclose inclusions of chalcopyrite, galena, pyrite and gangue. A small percentage occurs also as coarse to fine irregular grains disseminated in gangue.

Galena is much more abundant in these sections than in those made from the previous sample. It is present largely as small masses and irregular grains which are unevenly distributed throughout gangue and often intimately associated with sphalerite.

(Continued on next page)

(Character of the Ore, cont'd) -

Arsenopyrite is prevalent as medium to fine subhedral crystals erratically dispersed through the rocky portions of the gangue. A few grains are slightly fractured and healed with gangue, and inclusions of gangue are numerous.

Pyrite and chalcopyrite are each present in small amount as medium to fine irregular grains in gangue as well as small inclusions in sphalerite and galena. Tiny dots and dashes of chalcopyrite in sphalerite are very numerous in places.

Comparatively rare, small grains of pyrrhotite and one or two tiny grains of mineral resembling tetrahedrite are visible in the polished sections. The former mineral is usually associated with other sulphides in gangue; the latter is with an inclusion of galena in sphalerite.

Conclusion -

Since neither native silver nor silver minerals were observed in the sections, it is probable that this metal is carried by the galena. The latter was lightly etched with HNO_3 1:1 in several places but no silver mineral, such as argentite, was revealed. Hence it would appear that the silver is present in the galena in submicroscopic form.

Sampling and Assaying:

Owing to the nature of the test, no assay sample was cut from the shipment but a head sample assay, calculated from the products of a test, was as follows:

Silver	-	2.70 oz./ton.
Lead	-	1.80 per cent
Zinc	-	3.41 "

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Experimental Tests:

A sample of the ore was tested to determine its suitability or otherwise for treatment by the Huntington-Heberlein sink-and-float process. In this process a density separation is effected under static conditions in a bath of substantially stable galena medium. The medium is a suspension of fine galena in water and its effective density can be controlled to an accuracy of less than 0.01 by altering the proportions of galena and water. The medium used in this test was the same as would be used in a large scale plant test.

The test was conducted on a sample of ore crushed through one inch with material finer than 6 mesh screened out, a preliminary test having shown this to be the finest material that could be successfully treated by this process. The separation was made at a density of 3.00. The results of the test are given in the following tables:

Table I. - Distribution of Products from Crushing.

Product	Weight, per cent	Assay oz./ton: Ag	Assay Per cent: Pb	Assay Per cent: Zn	Distribution, per cent: Ag	Distribution, per cent: Pb	Distribution, per cent: Zn
S.F. Feed	81.4	2.68	1.64	3.07	80.84	74.13	73.17
Fines -6 mesh	18.6	2.78	2.50	4.92	19.16	25.87	26.83
Feed sample	100.0	2.70	1.80	3.41	100.00	100.00	100.00

Table II. - Distribution of Products from S.F. Separation.

S.F. conc.	59.2	3.95	2.20	3.87	87.35	79.49	74.71
S.F. tailing	40.8	0.83	0.82	1.90	12.65	20.51	25.29
S.F. feed	100.0	2.68	1.64	3.07	100.00	100.00	100.00

Table III. - Summary of Products from Pre-Concentration.

S.F. conc.	48.2	3.95	2.20	3.87	70.61	58.93	54.67
Fines -6 mesh	18.6	2.78	2.50	4.92	19.16	25.87	26.83
Product for further treatment	66.8	3.63	2.28	4.16	89.77	84.80	81.50
S.F. tailing	33.2	0.83	0.82	1.90	10.23	15.20	18.50
Feed sample	100.0	2.70	1.80	3.41	100.00	100.00	100.00

(Experimental Tests, cont'd) -

The results may be summarized as follows:

	Per cent
Proportion of ore available for S.F. feed. -	81.4
" " " fed to subsequent processes -	66.8
Weight elimination of S.F. feed -	40.8
" " of whole ore -	33.2

Assay of Products.

	Oz./ton	Per cent	
	Ag	Pb	Zn
Ore received	2.70	1.80	3.41
S.F. feed	2.68	1.64	3.07
S.F. conc	3.95	2.20	3.87
S.F. tailing	0.83	0.82	1.90
Product to further treatment	3.63	2.28	4.16

Metal Recovery.

	Ag	Pb	Zn
From S.F. feed	87.35	79.49	74.71
From whole ore	89.77	84.80	81.50

The result of the sink-and-float operation is therefore an elimination of 33.2 per cent of the ore mined as a coarse product assaying:

0.83 oz./ton in silver.
0.82 per cent lead.
1.90 " zinc.

Metal losses in this product are:

10.23 per cent silver.
15.20 " lead.
18.50 " zinc.

It will be noted that the product for further treatment assays just a little higher than the original ore and the tailing losses are somewhat high. This is due in part to the presence of a secondary gangue in the form of a

(Experimental Tests, cont'd) -

heavy ferruginous dolomite.

By bringing up the gravity of the medium to eliminate the dolomite, considerable quantities of mineralized quartz were floated while, at the same time, a lot of the dolomite remained with the "sink" to keep down its grade.

By separating at a gravity of 3.10 instead of 3.00, elimination would increase to 41.2 per cent of the whole ore and recoveries in the "sink" product plus fines would decrease to about 86 per cent of the silver, 77 per cent of the lead and 74 per cent of the zinc.

Conclusions:

Owing to the presence of both quartz and ferruginous dolomite as gangue minerals, both of which are to some extent mineralized, it seems impossible to make a low-grade reject and effect any worth-while increase in grade in the product to receive further treatment.

It therefore seems doubtful that anything would be gained by pre-treatment of the ore by this process.

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