



CANADA

BUREAU OF MINES
DIVISION OF METALLIC MINERALS
—
ORE DRESSING AND
METALLURGICAL LABORATORIES

DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

O T T A W A

March 16th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1181.

Concentration Tests on a Sample of Cobalt
Ore from Massey, Ontario.

Shipment:

One sack of ore, net weight 50 pounds, was received on December 9th, 1941. The shipment was submitted by Donald J. Russell, Mining Engineer, Cobalt, Ontario.

Location of Property:

This ore was taken from the property of the Big Game Syndicate at Massey, Ontario. Massey is about 75 miles west of Sudbury on the C.P.R. line to Sault Ste. Marie, Ontario.

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 -

The gangue is a mixture of milky white quartz and soft, dark grey rock material with abundant finely disseminated carbonate. In some places the quartz is a pinkish brown to red colour, probably due to the presence of erythrite, as mentioned below.

Metallic Minerals -

Metallic minerals are rather sparse in the polished sections and are represented almost entirely by hard, isotropic, creamy white, subhedral crystals, medium to fine in size, scattered unevenly through gangue. While etch and microchemical reactions do not definitely identify them, they do indicate them to be composite crystals of skutterudite $(Co, Ni)As_3$ with smaltite-chloanthite $(Co, Ni)As_2$. Some are dense, others contain tiny inclusions and irregular veinlets of gangue.

Erythrite (cobalt bloom) is quite prevalent in hand specimens as pinkish red coatings.

Sampling and Assaying:

A head sample cut from the shipment was assayed and reported as follows:

(Continued on next page)

(Sampling and Assaying, cont'd) -

Cobalt	-	2.13	per cent.
Nickel	-	0.21	"
Arsenic	-	3.32	"
Sulphur	-	1.43	"
Silver	-	0.20	oz./ton.

Experimental Tests:

A series of small-scale tests was conducted to determine recovery possible by table concentration and additional recovery to be obtained by floating the table tailing.

With the ore ground minus 20 mesh, 63.2 per cent of the cobalt was recovered in a table concentrate assaying 18.04 per cent cobalt. Examination of the tailing indicated that finer grinding was necessary to free the cobalt mineral.

A second table concentration test was conducted on ore ground minus 35 mesh in which 78.15 per cent of the cobalt was recovered in a concentrate assaying 20.91 per cent cobalt. An additional 13.6 per cent of the cobalt was recovered by floating the table tailing. The average grade of table and flotation concentrates in this test was 17.08 per cent cobalt.

The tests are described in detail as follows:

Test No. 1. - Table Concentration.

A sample of the ore was dry-crushed minus 20 mesh and sized on 35-, 65-, and 100-mesh screens. The various sized fractions were treated separately on a small table, each giving a concentrate and sand tailing while the finer ones also produced a slime tailing. The concentrates were all bulked together for assay, as were also the sand and slime tailings. A sample of the sand tailing was screened and examined under the microscope. The sizes coarser than

(Test No. 1, cont'd) -

35 mesh contained quite a lot of unfreed mineral.

Summary of Results:

Product	Weight, Assays				Distribution,		
	per cent	Per cent Co	Per cent Ni	Ag, oz./ton	Co per cent	Ni	Ag
Table concentrate	7.51	18.04	2.00	1.74	63.19	57.58	70.98
Table sand tailing	79.72	0.83	0.11	0.035	30.86	35.61	15.15
Table slime "	12.77	1.00	0.18	0.20	5.95	8.81	13.87
Feed (cal.)	100.00	2.14	0.26	0.18	100.00	100.00	100.00

Test No. 2. - Table Concentration followed by Flotation.

In this test the ore was dry-crushed minus 35 mesh and tabled as in Test No. 1. The table tailing was sampled for assay and a flotation test conducted on the remainder of it. The table tailing was reground all minus 48 mesh and 45 per cent minus 200 mesh with soda ash added to the ball mill at the rate of 10 pounds per ton of the tailing. A concentrate was then floated with 0.50 pound amyl xanthate and 0.10 pound pine oil per ton. The concentrate was cleaned without additional reagents.

Summary of Results:

Product	Weight, Assay,		Distribution of cobalt, per cent
	per cent	cobalt, per cent	
Table concentrate	9.40	20.91	78.15
Flotation concentrate	3.13	10.46	13.02
Cleaner tailing	0.98	1.50	0.58
Flotation tailing	86.49	0.24	8.25
Feed (cal.)	100.00	2.51	100.00

The average grade of concentrates, including cleaner tailing, was 17.08 per cent cobalt.

The foregoing tests show that moderately fine grinding is needed to liberate the mineral. Recovery in the table concentrate was increased from 63 to 78 per cent by stepping up the

(Experimental Tests, cont'd) -

grind from minus 20 to minus 35 mesh. An additional 13.6 per cent of the cobalt was recovered in the form of a flotation concentrate when the table tailing had been reground all through 48 mesh. The loss in the flotation tailing is largely erythrite, or cobalt bloom, which is a light, soft mineral that does not float and cannot be recovered on a table with any efficiency owing to its tendency to slime.

Conclusions:

The ore responds readily to table concentration and recovery by this method will increase with finer grinding up to somewhere in the neighbourhood of 35 mesh. Flotation of the table tailing after grinding to about 50 per cent finer than 200 mesh should increase total recovery to about 90 per cent.

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