O T T A W A September 23rd, 1940.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 900.

Cyanidation of a Gold Ore from the Vicour Gold Mines Limited, Louvicourt Township, Northwestern Quebec.

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:

On July 15th, 1940, a shipment of 89 pounds of sample rejects, contained in 185 bags, was received from C. O. Stee, Mine Manager, Siscoe Gold Mines, Limited, Siscoe Island, Quebec. A small specimen of typical vein material for microscopic study was also received at the same time. These shipments were taken from the Vicour Gold Mines Limited property in Louvicourt township, northwestern Quebec.

Characteristics of the Ore:

Six polished sections from the small specimen of typical vein material were prepared and examined under the reflecting microscope for the purpose of determining the character of the ore.

Gangue -

The gangue comprises more than half of the material forming the polished sections and is variable in character. Some is soft dark grey material containing rather abundant disseminated carbonate which gives a moderately strong microchemical test for iron; some is hard black mineral which, in the hand specimen, was seen to be slender acicular crystals of tourmaline.

Metallic Minerals -

Arsenopyrite and pyrite: Metallic mineralization in the sections examined consists essentially of arsenopyrite and pyrite. These two minerals occur together as small, coarsely crystalline masses and grains disseminated through gangue. Both contain numerous inclusions of gangue and both are considerably fractured and the fractures filled with gangue. Arsenopyrite is a little more abundant than pyrite.

Ilmenite(?): A relatively small quantity of an anisotropic grey mineral is visible as small irregular grains in gangue and in the sulphides. It is negative to all standard reagents and therefore could not be identified with certainty, but its physical properties suggest ilmenite. In any case, it is highly improbable that this mineral will cause any metallurgical difficulties in the treatment of this ore.

Pyrrhotite and chalcopyrite: Negligible

(Characteristics of the Ore, cont'd) -

quantities of these two minerals are visible as very rare tiny inclusions in arsenopyrite and pyrite.

Native gold: In spite of careful inspection of the six polished surfaces under the microscope no native gold was detected and nothing was learned as to its mode of occurrence.

Sampling and Analysis:

After mixing, cutting and sampling by standard methods, a representative portion of the reject shipment was obtained which assayed as follows:

Gold	-	0.16 oz./ton
Silver	-	0.02 "
Pyrrhotite	-	2.60 per cent
Copper	-	0.04 "
Arsenic	-	0.62 "
Sulphur	-	1.60 "
Iron	-	8.04 "

The combined shipment of sample rejects as received screened as follows:

Mesh	Weight, per cent
- 48 + 65	0.2
- 65 +100	1.2
-100 +150	3.4
-150 +200	7.2
-200	88.0
	100.0

Investigative Work:

Following the suggestions of the mine operators a number of cyanidation tests were conducted on the sample rejects. An extraction of 96.9 per cent of the gold was obtained and a cyanide residue of 0.005 ounce gold per ton when the pulp was aerated prior to agitation and a lead salt added to the agitator.

The details of the test work follow:

(Details of Test Work) -

Test No. 1 (A to C). - Straight Cyanidation.

Portions of the ore were bottle-agitated in cyanide solutions of 1 pound NaCN per ton strength for 24- and 48-hour periods. Sufficient lime was added to maintain protective alkalinity. The cyanide residues were assayed for gold and the pregnant solutions for reducing power.

Results: (Feed = Au, 0.16 oz./ton)

Test No.	Agitation, hours	Tailing assay, Au oz./ton	Extraction of gold, per cent	Titration, lb./ton solution NaCN	Titration, lb./ton solution CaO	Reagents consumed, lb./ton ore NaCN	Reagents consumed, lb./ton ore CaO	Reducing power, ml. N/10 $KMnO_4$ per litre.
1-A	24	0.04	75.0	1.00	0.10	0.80	5.8	160
1-B	48	0.035	78.1	0.96	0.10	1.04	9.8	230
1-C*	24	0.005	96.9	1.00	Trace	0.60	7.0	110

* 0.5 pound of $PbNO_3$ per ton of ore was added to Test No. 1-C prior to agitation.

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Test No. 2 (A to C). - Straight Cyanidation.

In this test, portions of the ore were reground in cyanide solutions of 1 pound NaCN per ton strength to pass 92.6 per cent minus 200 mesh. The pulps were then bottle-agitated for 24 or 48 hours. Enough lime was added to the grind and agitation to maintain alkalinity.

Results: (Feed = Au, 0.16 oz./ton)

Test No.	Agitation, hours	Tailing assay, Au oz./ton	Extraction of gold, per cent	Titration, lb./ton solution NaCN	Titration, lb./ton solution CaO	Reagents consumed, lb./ton ore NaCN	Reagents consumed, lb./ton ore CaO	Reducing power, ml. N/10 $KMnO_4$ per litre.
2-A	24	0.01	93.8	0.96	0.10	0.80	8.8	170
2-B	48	0.01	93.8	0.92	0.10	1.10	11.8	280
2-C*	24	0.005	96.9	1.00	0.05	0.80	7.5	130

* 0.5 pound of $PbNO_3$ per ton of ore was added to the grind in Test No. 2-C.

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(Details of Test Work, cont'd) -

Test No. 3 (A to D). - Aeration and Cyanidation.

In this test, portions of the ore were aerated in water or in a lime pulp for 6 hours prior to bottle-agitation in cyanide solution. In Tests Nos. 3-A and 3-B the pulps were aerated in water and in Tests Nos. 3-C and 3-D the aeration was in lime. In Tests Nos. 3-B and 3-D 0.5 pound of $PbNO_3$ per ton of ore was added prior to agitation.

Results: (Feed = Au, 0.16 oz./ton)

Test No.	Agitation, hours	Tailing assay, Au oz./ton	Extraction of gold, per cent	Titration, lb./ton solution NaCN	Titration, lb./ton solution CaO	Reagents consumed, lb./ton ore NaCN	Reagents consumed, lb./ton ore CaO	Reducing power, ml. N/10 $KMnO_4$ per litre.
3-A	24	0.02	87.5	0.90	0.10	1.00	8.8	150
3-B	24	0.01	93.8	1.00	0.10	0.80	8.8	130
3-C	24	0.005	96.9	1.00	0.15	0.40	6.7*	150
3-D	24	0.005	96.9	1.00	0.15	0.40	6.7*	60

* An additional 5 pounds of lime per ton of ore was consumed during aeration.

Summary and Conclusions:

A cyanide residue of from 0.01 to 0.005 ounce gold per ton was obtained by cyanidation when the sample was aerated in a lime pulp and a soluble lead salt added during the agitation period. The consumption of cyanide was slightly above normal and the consumption of lime was high. This high lime consumption probably was due to the ore having been crushed and kept in a finely pulverized condition for some time. The fouling of the cyanide solutions was largely corrected by aeration and

(Summary and Conclusions, cont'd) -

the addition of $PbNO_3$ to the agitation.

Owing to the crushed condition of the shipment when received it was not possible to determine the fineness of grinding necessary for cyanidation.

These preliminary tests indicate that it is reasonably safe to assume that there will be no real metallurgical difficulties encountered in the treatment of this ore.

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