

O T T A W A

April 20, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2028.

Summary of Tests on Samples of Gold Ore and Mill
Tailings from the Sullivan Consolidated Mines
Limited, Sullivan P.O., Abitibi, Quebec.

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Note:

This report relates essentially to the samples as received. It shall not, nor any correspondence connected therewith, be used in part or in full as publicity or advertising matter for the sale of shares in any promotion.

(Copy No. 7.)

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Material Received and Object of Investigation:

A shipment of 353 pounds of ore and 88 pounds of mill tailings was received from J. A. Roland Faucher, Mill Superintendent, Sullivan Consolidated Mines Limited, Sullivan P.O., Abitibi, Quebec, on February 18, 1946.

A letter received from Mr. Faucher on February 1, 1946, had requested an investigation to determine why the fine free gold in the tailings does not go into solution in the cyanide circuit.

Location of Property:

The Sullivan Consolidated Mines Limited property is located in Dubuisson township, Abitibi, Quebec.

Sampling and Analysis:

The ore was crushed, sampled and assayed by standard methods. The mill tailings were dry when received. They were also sampled and assayed.

The analysis results were as follows:

	<u>Ore</u>	<u>Mill Tailings</u>
Gold, oz./ton -	0.305	0.04
Iron, per cent -	4.13	
Sulphur, " -	0.35	

Microscopic Examination:

Ten polished sections, six from the ore and four from the tailings, were prepared at the Laboratories and examined under a reflecting microscope.

Ore Sample -

In the polished sections, gangue is a mixture of milky white to clear glassy quartz and soft, light to dark greenish-grey rock material. Under crossed nicols, some of the glassy quartz grains give blue-coloured internal reflections. A drop of acid (1:1 HCl) on a polished surface shows a small amount of finely disseminated carbonate to be present. A microchemical test for iron made on the latter mineral gave a very faint reaction.

Metallic mineralization is very sparse in the polished sections and is represented by pyrite, chalcopyrite and ilmenite(?) as rare small grains disseminated through gangue. Pyrite, the most abundant metallic, occurs as scattered grains and subhedral crystals up to about one millimetre in size. Chalcopyrite, visible as rare tiny grains which average 35 to 40 microns (400 mesh) in size, is not present in sufficient quantity to act as a cyanicide. A small amount of a hard grey anisotropic mineral, negative to all standard etching reagents and regarded as ilmenite, was observed as occasional tiny, ragged particles unevenly distributed throughout the gangue.

Gold -

No gold was observed in the six ore specimens

(Microscopic Examination, cont'd) -

examined under the microscope. Approximately one hundred and fifty grams of the minus twenty mesh ore was panned in a gold pan. The resulting concentrate, weighing approximately three grams, was examined with a binocular microscope. Several pieces of gold were observed, ranging in size from 32 microns (500 mesh) to 160 microns (100 mesh). One piece of gold examined was badly tarnished, but the remainder were bright and shining.

Mill Tailings -

Four briquetted samples of the mill tailings were prepared and examined microscopically.

The polished surfaces are composed very largely of fragments of gangue, ranging in size from about 300 microns (-35 +48 mesh) down to only a few microns in size, embedded in the mounting bakelite. Metallic minerals are comparatively scarce and are visible as occasional small grains of pyrite, and rare tiny particles of chalcopyrite and ilmenite(?). The metallic grains are predominately free but are sometimes attached to gangue.

Gold -

No gold was observed in the four specimens. Approximately 150 grams of the tailings was panned in a gold pan and the concentrate examined with a binocular microscope. No gold was observed. Another sample was panned in a similar manner and the concentrate cleaned with a strong solution of sodium hydroxide. Examination with a binocular microscope revealed several pieces of gold. These ranged in size from 160 microns (100 mesh) to 48 microns (325 mesh). These pieces of gold appeared ragged and pitted as if they had been attacked by the cyanide solutions but had not had sufficient time of contact to be completely dissolved.

Result of Investigations:

Tailing.

Seventy-five per cent of the gold in the mill tailing sample was extracted by cyanidation in 24 hours, to give a residue assaying 0.01 ounce gold per ton. Sixty-two and a half per cent of the gold in the tailing was recovered by amalgamation. These tests indicate that the coarse gold in the ore did not have sufficient time of contact to dissolve.

Ore.

Cyanidation tests carried out showed that an extraction of 93.4 per cent of the gold with a tailing assay of 0.02 ounce gold per ton can only be increased with a grind finer than 90 per cent minus 200 mesh, or with a coarser grind and an agitation period of over 100 hours.

Infrasizer tests on a cyanidation tailing showed that the gold values were very evenly distributed in all the various sizes down to minus 10 microns and would require very fine grinding for further extraction.

Corduroy blanket tests showed that by removing a blanket concentrate and regrinding this concentrate before cyanidation, the tailing assay could be reduced to 0.017 ounce gold per ton with an extraction of 94.4 per cent of the gold. If corduroy blankets were installed in the mill circuit, they would serve as collectors for free gold as well as for gold-bearing sulphides.

Flotation followed by cyanidation of the flotation tailings and of the reground flotation concentrates resulted in an extraction of 94.3 per cent of the gold and a combined tailing assay of 0.017 ounce gold per ton.

DETAILS OF EXPERIMENTAL TESTS:

I. - MILL TAILINGS.

Test No. T2 - Cyanidation.

A charge of 1,000 grams of mill tailings was cyanided at 2 to 1 dilution for 24 hours. Solution was maintained at 1.0 lb./ton NaCN and 1.0 lb./ton CaO.

Results -

Assay of Feed	-	0.04 Au oz./ton
Assay of Tailing	-	0.01 " "
Extraction of gold	-	75.0 per cent
Reagents consumed:		
NaCN	-	0.12 lb. per ton ore
CaO	-	3.80 lb. per ton ore

Test No. T3 - Amalgamation.

A charge of 1,000 grams of mill tailings at 1 to 1 dilution was agitated with 7 c.c. of mercury for one hour in a porcelain mill.

Results -

Assay of Feed	-	0.04 Au oz./ton
Assay of Tailing	-	0.015 " "
Extraction of gold	-	62.5 per cent

II - MILL ORE.

Tests on Agitation Period.

Four tests were made to determine the effect of time of agitation on recovery.

Results

Test No.	Agitation, hours	Grind, % -200 mesh	Assay, Au, oz./ton Feed	Assay, Au, oz./ton Residue	Recovery, per cent	Reag. cons., lb./ton ore NaCN	Reag. cons., lb./ton ore CaO
3	48	78	0.305	0.02	93.4	0.40	4.56
8	72	78	0.305	0.02	93.4	0.60	4.48
12	96	78	0.305	0.02	93.4	0.76	4.44
13	120	78	0.305	0.015	95.1	0.60	4.56

Tests on Grind.

Five tests were made to determine the effect of grind on the extraction of the gold, other factors being kept constant.

(Details of Experimental Tests, cont'd) -

Results

Test No.	Agitation, hours	Grind, % -200 mesh	Assay, Au, oz./ton		Recovery, per cent	Reag. cons., lb./ton ore	
			Feed	Residue		NaCN	CaO
3	48	78	0.305	0.02	93.4	0.40	4.56
4	48	83	0.305	0.02	93.4	0.32	4.64
5	48	88	0.305	0.02	93.4	0.40	4.72
2	48	90	0.305	0.015	95.1	0.32	4.42
16	48	91	0.305	0.0275	91.0	0.36	4.72

The dilution was 2 to 1.

Solution strength:

NaCN - 1.0 lb./ton solution.
CaO - 1.0 " "

Test No. 16A.

The cyanide residue from Test No. 16 was screen-sized and the minus 200 mesh material was infrasized. The various sizes were assayed for gold.

Results

Screen Size	Micron Size	Weight, per cent	Assay, Au, oz./ton	Distribution of gold, per cent
+150	+104	1.4	0.025	1.2
-150+200	-104+74	7.4	0.020	5.1
-200+270	-74 +56	4.1	0.130	18.2
-270+380	-56 +40	31.0	0.030	31.7
-380+530	-40 +28	16.6	0.030	17.0
-530+750	-28 +20	12.8	0.020	8.7
-750+1060	-20 +14	7.2	0.020	4.9
-1060+1500	-14 +10	5.9	0.020	4.0
-1500	-10	13.6	0.020	9.2
Head		100.0	0.029	100.0

Blanket Concentration and Cyanidation.

Test No. 10.

2,000 grams of ore, ground 83 per cent minus 200 mesh was passed over a corduroy blanket at a slope of $1\frac{1}{2}$ inches per foot. The concentrates were ground approximately 90 per cent minus 325 mesh and cyanided for 72 hours. The blanket tailings was cyanided for 72 hours. Dilution in both leaches

(Details of Experimental Tests, cont'd) -

was 2 to 1. NaCN and CaO were maintained at 1.0 lb./ton solution.

Results of Blanket Test

Product	Weight, per cent	Assay, Au, oz./ton	Distribution, per cent
Blanket conc.	6.35	3.18 ^o	71.0
Blanket tailing	93.65	0.11	29.0
Feed	100.0	0.305	100.0

^o Calculated.

Results of Cyanidation Tests

	Weight, per cent	Assay, Au, oz./ton	Extraction of gold, per cent	Reagent Consumption, lb./ton ore	
				NaCN	CaO
Blanket conc.	6.35	3.18 ^o	98.4	4.0	8.0
Blanket tailing	93.65	0.11	86.4	0.4	4.28
Feed	100.00	0.305	94.4	0.63	4.52

^o Calculated.

Flotation and Cyanidation.

Test No. 19.

2,000 grams of ore was first ground in a ball mill to give 76 per cent minus 200 mesh and was then floated.

Reagents Added:

<u>To Grinding -</u>	<u>Lb./ton</u>
Aerofloat No. 208 -	0.10
Aerofloat No. 25 -	0.06
Reagent No. 301 -	0.10

To Flotation -

Aerofloat No. 25 -	0.06
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pH, 9.3.
Conditioning, 3 minutes.
Flotation, 7 minutes.

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(Details of Experimental Tests, cont'd) -

Results			
	Weight, per cent	Assay, Au, oz./ton	Distribution of gold, per cent
Flot. conc.	11.9	2.38 [Ⓢ]	92.8
Flot. tailing	88.1	0.025	7.2
Feed	100.0	0.305	100.0

[Ⓢ] Calculated.

The concentrate was ground in a pebble mill to 98 per cent minus 325 mesh. The reground concentrate and flotation tailings were cyanided separately for 48 hours at a 2 to 1 dilution. A solution strength of 1.0 lb./ton NaCN and CaO was used for the tailings; 2.0 lb./ton NaCN and 1.0 lb./ton CaO were used for the concentrate.

Results of Cyanidation

	Weight, per cent	Assay, Au, oz./ton	Extraction of gold, per cent		Reagent Consumption, lb./ton ore	
			Feed:Residue	in Product: Gold	Total Gold	NaCN: CaO
Flot. conc.	11.9	2.38 [Ⓢ]	0.11	95.5	88.5	3.06:17.64
Flot. tailing	88.1	0.025	0.005	80.0	5.8	0.08: 3.28
Feed	100.0	0.305	0.017		94.3	0.43: 4.99

The results of this test indicate that no economic increase in recovery is obtained by using flotation in the place of corduroy blankets.

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