Report of the Ore Dressing & Metallurgical Laboratories
Report No 320

The Recovery of Gold from the Ore of the British-Canadian Mines, Ltd., Mine Centre, Ont.

By A. Richardson

Shipments Two hundred pounds of ore were received at the Ore Dressing Laboratories, consigned from Mine Centre, Ont.

Characteristics of the Ore. The ore consisted of quartz and altered basic rock, containing small amounts of iron pyrite. These sulphides were segregated along fractures in the predominating quartz portion of the ore.

Purpose of Experimental Tests. The investigation was made to determine what recovery of the gold in the ore can be obtained by amalgamation and by cyanidation, and to determine the most suitable method of milling to employ.

Sampling and Analysis. The total lot was crushed to pass 14 mesh, passed through a Jones Riffle Sampler and after crushing through 35 mesh and 65 mesh, with intervening cuts being made through the sampler, a sample portion was secured for analysis. This showed an assay value of 0.60 oz gold per ton. A trace of copper was also reported, no other economic metals being present.

As the percentage of sulphides present was low, ~~no concentration tests were made~~, the investigation consisted of amalgamation and cyanide tests to determine the adaptability of the ore to these processes.

The behavior of the material at different sizes was investigated. Three portions of 100 grams each were crushed to pass, 1st 65 mesh, 2nd, 100 mesh, and 3rd 150 mesh. Amalgamation was tried on the coarsely ground lot, minus 65 mesh. Cyanide tests were made on all three. The tailings from the cyanide tests were screened through 150 mesh, and the +150 and -150 mesh portions assayed separately. This was done to note any difference in the gold content of the coarser and finer material in the sample under investigation. The detailed tests follow:

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Test N°1

Amalgamation at 65 mesh.

1000 grams of the ore -65 mesh was amalgamated with mercury, the amalgam separated and the tailing assayed.

Screen Sizes

	%
+ 65	= 0.0
-65 +100	- 41.7
-100 +150	- 11.6
-150 +200	- 13.8
-200	32.9
	100.0

	Assay Au $/ton
Heads	0.60
Tailing	0.11
Recovery	81.7 %.

This test shows that a large amount of the gold is readily recovered by amalgamation. However, the residue still contains considerable gold, which to be recovered, would necessitate finer grinding of the amalgamation tailing.

Test N° 2. Cyanidation at 65 mesh.

200 grams of ore -65 mesh were agetated for 48 hours with 400 grams of sodium cyanide solution containing 2.0 lbs KCN per ton. Lime was added at the rate of 5 lb per ton of ore.

Strength of Solution after 48 hrs. lb/ton — KCN = 1.85, CaO 0.30.

Consumption, lb/ton ore — KCN 0.30, CaO 4.4

	% Wt.	Assay Au $/ton
Heads		0.60
Tailing +150 mesh	60.0	0.01
" -150 "	40.0	0.01
Average Tailing		0.01
Recovery	98.3 %	

This test shows that material crushed to pass 65 mesh, with 41.7% remaining on 100 mesh, yields quite readily to cyanidation.

Test Nº 3. Cyanidation at -100 mesh.

200 grams of ore - 100 mesh were cyanided under the same conditions as those of Test Nº 2.

Strength of solution after 48 hrs. lb/ton KCN 1.85
CaO 0.20

Consumption, lb/ton ore KCN 0.30
CaO 4.6

	% Weight	assay Au $/ton
Heads		0.60
Tailing +150 mesh	22.2	0.01
" -150 "	77.8	0.005
Average Tailing		0.006

% Recovery 99.0 %

This test confirms the results obtained on the preceding test, the extraction of the gold is high at first coarse sizes. A slight increase is noted by grinding finer than 65 mesh.

Test Nº 4. Cyanidation at -150 mesh.

200 grams of ore - 150 mesh were cyanided under conditions similar to those of Tests Nº 2 + 3.

Strength of solution after 48 hrs. lb/ton KCN = 1.70
Ca O = 0.15

Consumption, lb/ton ore KCN 0.60
CaO 4.7

	% Wt.	assay Au $/ton.
Heads		0.60
Tailing +200 mesh	16.1	0.015
" -200 "	83.9	0.005
Average Tailing		0.007

Recovery 98.8 %.

This test shows that no advantage is to be gained by ~~fine~~ fine grinding. A higher cyanide consumption results from cyaniding at this mesh, -150.

Test No 5

This test was made on the same class of material as test No 4, ore ground to pass 150 mesh. Conditions of cyanidation were also the same, with the exception that 6 lb lime per ton of ore were added instead of 5 lb. Time of agitation was 48 hours.

Strength of solution after 48 hrs. lb/ton KCN 1.75
CaO 1.00

Consumption; lb/ton ore KCN 0.50
CaO 4.00

	~~%~~ Wt	Assay Au oz/ton.
Heads		0.60
Tailing		0.005
Recovery	99 %	

This ~~checks~~ bears out the results of ~~Test No 1 to 3~~, the previous tests, showing that the ore gold is quite readily soluble in cyanide solution, and that a higher cyanide consumption results from agitating the finely ground material.

The following summary of the various cyanide tests shows the results attained.

Test No	Mesh Grinding	Time of Agitation, Hrs.	KCN consumed lb/ton	Lime Consumed lbs/ton	Tailing Au oz/ton	% Recovery
2	-65	48	0.30	4.4	0.01	98.3 %
3	-100	48	0.30	4.6	0.006	99.0
4	-150	48	0.60	4.7	0.007	98.8
5	-150	48	0.50	4.0	0.005	99.0

The ease with which the gold is extracted by cyanide, makes the milling of this ore a simple problem. 81.7 % of the metal is recovered by amalgamation, but leaves $\frac{1}{2}$ oz in the residue. Cyanidation of this amalgamation tailing would result in the saving of the contained values. However, 98.3 % of the gold is recovered by cyaniding

at the same coarse grinding that yielded 81.7% recovery by amalgamation. This shows that no metallurgical advantage will be gained by employing amalgamation.

By grinding to pass 100 mesh, with 22% remaining on 150 mesh, a recovery of 99% is secured. No advantage is obtained by grinding finer, in fact a slightly higher consumption of cyanide results.

The process indicated is a ~~cyanide plant~~ treatment by cyanide, the ~~crushing and grinding~~, with ore ground between 65 and 100 mesh. The absence of refractory material and minerals harmful to the cyanide process insures clean mill solutions, with no decrease in efficiency.

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