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THE RECOVERY OF GOLD IN MILL PRODUCTS FROM COCHENOUR WILLANS GOLD MINES LIMITED, COCHENOUR, ONTARIO

by

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MINERAL PROCESSING DIVISION

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W.K. Stokes* and R.W. Bruce**

SUMMARY OF RESULTS

A sample of flotation tailing contained 0.108 oz Au/ton of which 45 percent was contained in fractions coarser than 200 mesh. Microscopic examination of the tailing showed that the gold was associated with gangue minerals.

Cyanidation of three samples of calcine for 24 hours, as received, gave gold extraction of 94.0, 91.6 and 91.9 per cent from samples roasted at 1500° C, 1320° C and 1200° C respectively.

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INTRODUCTION

Location of Property

Cochenour Willans Gold Mines Limited is a gold producer in Dome Township in the Red Lake area of northwestern Ontario.

Shipments

On April 2, 1965, the following samples were received from the property:

Calcine - three bags, received wet, previously roasted at 1200, 1320 and 1500° C with weights of 16, 11, and 22 lb respectively (dry net weight).

Flotation tailing
- one cannister containing a dry sample weighing 437 grams (net).

Nature of Investigation Requested

In a letter dated March 30, 1965 Mr. E.A. Lago, Assistant Mill Superintendent, requested testwork on the mill products to determine:

(a) The analysis of the calcine for sulphur as sulphide and sulphate, iron, arsenic, antimony and insoluble.

(b) If grinding the calcine is necessary before cyanidation.

(c) If 36 hours is sufficient retention time during cyanidation.

(d) A comparison of gold extractions from the three calcines.

(e) Nature of refractory gold in calcine residue.

(f) The percentage of gold in various size fractions of the calcines.

(g) Analysis of size fractions from +65 mesh to infrasizing of the flotation tailing.

Sampling and Analysis

The samples of calcine were designated Calcine A (1200° C), Calcine B (1320° C) and Calcine C (1500° C). Each sample of calcine was dried, screened and split into 500 gram portions on a Jones Sampler. Head samples were removed for analyses.

The sample of flotation tailing was split into two parts for infrasizing and the various sized products were sent for analysis.

TABLE I

Head Sample Analyses of Calcines

Component	Calcine A	Calcine B	Calcine C
Gold (Au)	4.71 oz/ton	2.84 oz/ton	2.49 oz/ton
Silver (Ag)	0.495 " "	0.35 " "	0.31 " "
Sulphide Sulphur (S)	0.40%	0.97%	0.27%
Sulphate Sulphur (SO_4)	0.50 "	0.73 "	0.81 "
Iron (Soluble Fe)	27.32 "	30.56 "	33.57 "
Arsenic (As)	2.89 "	2.51 "	2.76 "
Antimony (Sb)	0.17 "	0.17 "	0.16 "
Insoluble	48.79 "	42.10 "	38.76 "

DETAILS OF INVESTIGATION

Flotation Tailing

A screen and infrasizer analysis was carried out to determine the distribution of gold in the various sizes from +100 mesh to -10 micron.

To determine the mode of occurence of native gold in the flotation tailing the sized products were superpanned. A superpanner concentrate was recovered from each and submitted for mineralogical examination. A polished section was made from each concentrate and systematically traversed at one millimeter intervals under an ore microscope, using a high-power objective. A few particles of native gold were encountered but all of them were combined with gangue minerals, either as inclusions or attached particles.

TABLE 2

Screen and Infrasizer Analysis of Flotation Tailing

Product	Weight %	Assays Au oz/ton	Distribution Au %
+100 mesh	10.7	0.145	14.3
+150 "	15.0	0.160	22.2
+200 "	7.4	0.125	8.6
+56 micron	5.8	0.152	8.1
+40 "	11.3	0.080	8.3
+28 "	13.6	0.056	7.0
+20	9.9	0.058	5.3
+14 "	7.4	0.070	4.8
+10 "	5.5	0.104	5.3
-10 "	13.4	0.130	16.1
Head (calcd)	100.0	0.108	100.0

The number and size of gold particles observed are shown in Table 3.

TABLE 3

Gold Observed in Polished Sections

Sample No.	Product Size	Number of Gold Particles	Max. Dimensions (Microns)
A	+150 mesh	-	-
B	+200 "	3	14, 8, 3
C	+56 micron	2	6, 3
D	+40 "	-	-
E	+28 "	-	-
F	+20 "	-	-
G	+14 "	-	-
H	+10 "	-	-

N.B. All above particles were locked with gangue.

Calcines

Screen analyses were performed on:

Calcine A (1200°C), Calcine B (1320°C) and Calcine C (1500°C) as received (Table 4); and after a 30 minute wet grind in a porcelain ball mill (Table 5).

Screened products from each of the Calcines A, B & C (as received) were sent for analysis and the distribution of gold in sizes from +100 to -325 mesh was calculated.

TABLE 4

Screen Analysis of Calcines as Received

Product Size	Weight %	Assays Au oz/ton	Distribution Au %
Calcine A			
+100 mesh	6.2	2.23	2.9
+150 "	9.8	2.25	4.6
+200 "	4.4	2.56	2.3
+325 "	7.1	2.60	3.8
-325 "	72.5	5.77	86.4
Head (calcd)	100.0	4.84	100.0
Calcine B			
+100 mesh	4.8	2.98	5.4
+150 "	11.8	1.41	0.6
+200 "	7.8	1.36	4.0
+325 "	15.6	1.495	8.7
-325 "	60.0	3.60	81.3
Head (calcd)	100.0	2.65	100.0
Calcine C			
+100 mesh	3.9	2.22	3.5
+150 "	12.9	0.92	4.8
+200 "	10.5	0.84	3.6
+325 "	22.6	0.90	8.3
-325 "	50.1	3.91	79.8
Head (calcd)	100.0	2.35	100.0

TABLE 5

Screen Test of Calcines after 30 min Grind

Calcine	Size (Mesh)	Weight %
A	+150	0.2
	+200	2.0
	+325	4.0
	-325	93.8
B	+150	0.4
	+200	2.6
	+325	5.8
	-325	91.7
C	+150	0.4
	+200	3.2
	+325	8.0
	-325	88.4

Cyanidation tests on the calcines were carried out using 500 gram weights of calcine for each test with variation in the grinding and cyanidation times . The samples of calcine were washed three times with fresh water in a filter, repulped to 33.3% solids and cyanided with the solution strength maintained at 1.0 lb of sodium cyanide per ton and 0.5 lb of lime per ton.

The cyanidation results obtained are shown in Tables 6, 7, 8 and 9.

TABLE 6

Cyanidation of Calcines for 24 hours (No Grinding)

Sample	Head Au/ton	Tailing Au/ton	NaCN Consumed lb/ton	CaO Consumed lb/ton	*Extraction %
Calcine A	4.71	.380	8.0	3.56	91.9
Calcine B	2.84	.240	1.92	4.04	91.6
Calcine C	2.49	.155	.72	3.28	94.0

TABLE 7

Cyanidation of Calcines for 48 hours (No Grinding)

Sample	Head Au/ton	Tailing Au/ton	NaCN Consumed lb/ton	CaO Consumed lb/ton	*Extraction %
Calcine A	4.71	.305	7.44	3.56	93.5
Calcine B	2.84	.210	5.6	3.88	92.6
Calcine C	2.49	.145	0.96	3.20	94.4

*Calculated by difference

TABLE 8

Cyanidation of Calcines for 24 hours after 30 min Grind

Sample	Head Au/ton	Tailing Au/ton	NaCN Consumed lb/ton	CaO Consumed lb/ton	*Extraction %	R.P. cc of N/10 KM04/1
Calcine A	4.71	.370	10.96	4.44	92.1	676
Calcine B	2.84	.180	2.08	5.00	93.7	712
Calcine C	2.49	.260	5.12	5.72	89.6	268

TABLE 9

Cyanidation of Calcines for 48 hours after 30 min Grind

Sample	Head Au/ton	Tailing Au./ton	NaCN Consumed lb/ton	CaO Consumed lb/ton	*Extraction %	R.P. cc of N/10 KM04/1
Calcine A	4.71	.300	14.08	5.40	93.6	696
Calcine B	2.84	.180	2.96	5.88	93.7	740
Calcine C	2.49	.180	5.92	6.84	92.8	284

*Calculated by difference.

Further to these observations, there was noted a reduction in calcine weight (originally 500 gm) after cyanidation. Calcine A had a 6.0 % loss; Calcine B 2.2% and Calcine C 1.8%.

CONCLUSIONS

The sample of flotation tailing contained 0.108 oz Au/ton (calculated assay). This is an appreciable amount of gold, of which 45 per cent is contained in fractions coarser than 200 mesh. From microscopic examination, the gold was combined with gangue minerals either as inclusions or attached particles, which would account for its presence in the flotation tailing.

Cyanidation of the flotation tailing should extract a fair amount of this gold particularly if the coarse fractions, which could be separated by cycloning, were reground. There was insufficient material to do testwork to confirm this but this work could be done easily at the mine laboratory.

The investigation of the calcines seems to point towards a higher recovery of gold at the roasting temperature of 1500° C. Also, while obtaining a gold recovery of 94.0% from Calcine C, consumption of sodium cyanide and lime was appreciably lower than was the case with the two other calcines which were produced at lower temperatures. Regrinding of the calcines does not appear to be necessary and a 24 hour retention time was sufficient for good gold extraction during cyanidation.

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