

TR 16-280-281

R.627. Leaching tests on copper carbonate ore from the Orieco mine, Scamander.

A sample of oxidised copper ore, weighing approximately 1.6 kg, from the Orieco mine at Scamander was submitted by Scamander Mining Corporation N.L. for leaching tests to determine the copper recovery.

TEST WORK

The sample was dried under the drying lamps and screened on a $\frac{1}{2}$ inch screen. The major portion of the sample passed through the screen. The oversize was roll crushed and again screened on the $\frac{1}{2}$ inch screen.

The sample was then well mixed and riffled to provide a head sample for assay purposes and a large sample from which test samples could be cut.

Leaching tests were conducted by taking 500 g of sample and agitating the sample with the same weight of acid solution in 2.5 litre acid reagent bottles rolling on rubber rollers for definite time periods.

In tests N1 and N2, the sulphuric acid strength was 10%. After the first two tests, the results indicated that more copper was going into solution than could be accounted for by the acid consumption. Accordingly a test was conducted in which a quantity of water was used of equal volume to the acid solutions in the first two tests.

In tests N4, N5, and N6, the sulphuric acid strengths were 5%, 15%, and 5% respectively.

The conditions used in the leaching tests are shown together with the results of the tests in the table.

The head sample assayed 3.3% copper.

Test Conditions and Results

Test No.	Acid Strength Weight %	Agitation time (minutes)	Residue Assay % Cu	Head Assay (calculated) % Cu	Cu Recovery in solution %	Acid Consumption lb/ton of ore
N1	10	30	0.38	3.56	90.0	90.9
N2	10	60	0.23	3.43	93.9	90.5
N3	water	45	2.8	3.27	16.7	-
N4	5	60	0.37	3.33	89.7	76.6
N5	15	60	0.27	3.40	92.7	100.3
N6	5	120	0.06	3.14	98.2	79.0

TEST RESULTS

These results show that 16.7% of the copper is present in a water-soluble form.

Good recovery of copper can be obtained by agitation in dilute sulphuric acid. About 90% of the copper can be recovered by agitating the ore for half an hour in 10% sulphuric acid or by agitating for twice as long with half strength (5%) sulphuric acid. Acid consumption is reduced appreciably when using the weaker acid solution. Better recoveries were obtained with 10% sulphuric acid, and 15% sulphuric acid with one hour's agitation. However, acid consumption increases as the strength of acid is increased. By

agitating in 5% sulphuric acid for 2 hours, the best recovery of the series was obtained. A recovery of 98% of the copper resulted with the residue assaying 0.06% Cu. Acid consumption at this strength of acid is again low by comparison.

In washing the residue from one vessel to another during the tests some cassiterite was noticed. Accordingly, the residue from one of the tests was assayed and found to contain 0.07% Sn.

CONCLUSIONS

Good recoveries of copper (as high as 98%) can be obtained by leaching the ore with sulphuric acid.

Acid consumption can be minimised by using dilute acid, and recovery can be enhanced by using prolonged periods of agitation in the dilute acid.

16.7% of the copper in the ore is water soluble.

Tin is present in the ore and after copper extraction the residue assays 0.07% tin.

TREATMENT METHOD

Based on the above general observations the following treatment plan was adopted.

- (1) Hand sorting to discard +75 mm quartzite.
- (2) Jaw crushing crushed ore to -3 inch (75 mm) and screen jaw crusher product to 1/2 inch and 1/4 inch.
- (3) Heavy liquid separation at a specific gravity of 1.70 of the -3 inch +1/2 inch and -1/2 inch fractions.
- (4) Flotation and sinks from (3) to give float and sink of -3 inch +1/2 inch, -1/2 inch, -1/4 inch, -1/8 inch and -1/16 inch.

Product from the above operations provided data for the assessment of the benefits of hand sorting and heavy media separation throughout the size range produced for these procedures, and a derived head value for the ore sample.

- (5) Concentrate the solution in the 1 inch fraction by aeration and testing to properly verify the results obtained by similar treatment of Mc Neil ore in investigation R.616 (Technical Report No. 12/184-190, 1973).