

TR17-173-174

R.609 Solubility of arsenic in mixtures of North West Acid calcine, sea water and Titan effluent.

A sample of calcine (Sample 710861) produced when roasting Mt. Lyell and Rosebery pyrite in the ratio 75:25 was submitted by North West Acid Pty. Ltd. This sample was stated to contain only about half the arsenic that would be expected when equal parts of each pyrite were being roasted.

The sample assayed as follows:

% Fe	% S	% Cu	% Pb	% Zn	% As	% Ca
0.57	1.5	0.28	0.28	0.42	0.3	0.04

TEST WORK

Five solution samples were prepared and numbered as follows:

- (1) Titan effluent only
- (2) 1% effluent in sea water
- (3) 0.22% effluent in sea water
- (4) 0.1% effluent in sea water
- (5) sea water only

Forty grams of calcine were added to 400 ml of each solution sample and the mixtures stored in 500 ml measuring flasks. Each flask was stoppered, shaken for about 30 s and then allowed to stand.

After 24 hours, 25 ml of clear liquor was withdrawn from each flask and the arsenic content was determined by X-ray fluorescence (XRF). After the determinations, the samples were returned to the respective flasks and each flask was then shaken for about 30 s, and then allowed to stand.

Subsequent arsenic determinations were made after successive weekly intervals following the above procedure.

The results were as follows:

Soln No.	24 Hrs	Week:	Arsenic Content (ppm)							
			1	2	3	4	5	6	7	8
1	115		135	149	145	146	149	144	148	147
2	17		17	16	-	-	-	-	-	-
3	7.3		11	13	13	15	13	12	14	11
4	4.5		5.6	8.4	7.5	10	7.2	7.5	8.0	9.2
5	0.6		1.6	4.0	3.2	5.4	3.0	2.9	3.5	2.8

Note Solution 2 was accidentally lost after week 2.

The sea water from Test 5 was decanted off and replaced with a fresh volume of sea water and weekly arsenic determinations were again resumed for a further three weeks. In each case the arsenic content was less than 2 ppm.

CONCLUSIONS

The solubility of the arsenic in the calcine produced by North West Acid Pty. Ltd. was considerably lower than the arsenic in the experimentally prepared calcine.

In each of the solution samples, the arsenic content reached a plateau after two weeks. In the presence of Titan effluent the solubility of the arsenic in the calcine increases.

In the case of sea water, the level of the plateau was about 3 ppm of arsenic in solution. Replacement of this sea water with fresh sea water resulted in little or no further arsenic going into solution (less than 2 ppm being detected).

Five solution samples were prepared and numbered as follows:

- (1) Titan effluent only
- (2) 1% effluent in sea water
- (3) 0.25% effluent in sea water
- (4) 0.1% effluent in sea water
- (5) sea water only

Forty grams of calcine were added to 400 ml of each solution sample and the mixtures stored in 750 ml measuring flasks. Each flask was stoppered and shaken for about 10 s and then allowed to stand.

After 24 hours, 25 ml of clear liquor was withdrawn from each flask and the arsenic content was determined by X-ray fluorescence (XRF). After the determinations, the samples were returned to the respective flasks and each flask was then shaken for about 10 s, and then allowed to stand.

Subsequent arsenic determinations were made after successive weekly intervals following the above procedure.

The results were as follows:

Soln No.	24 hrs	Arsenic Content (ppm)				
		1	2	3	4	5
1	112	132	140	145	148	148
2	17	17	18	-	-	-
3	7.3	11	12	12	12	14
4	4.5	2.6	2.4	2.5	2.5	2.5
5	0.5	1.8	2.0	2.1	2.2	2.2

Note: Solution 2 was accidentally lost after week 1.