

## FALCONBRIDGE NICKEL MINES LIMITED

INTER-OFFICE MEMORANDUM

DATE: June 26, 1979

TO: R.A. Bergman

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FROM: H.T. Evans

SUBJECT: LEACHING OF ARSENIC TRIOXIDE - GIANT YELLOWKNIFE

With reference to the captioned subject, a review of solubility data quoted by Seidel-Linke prompts the inquiry whether the presence of a limited quantity of arsenious acid ( $H_3AsO_4$ ) might not be beneficial in the recovery circuit proposed for Giant Yellowknife. The data quoted by Linke is as follows:

<u>T°C</u>	<u>H<sub>2</sub>O (a)</u>	<u>H<sub>3</sub>AsO<sub>4</sub>(b)</u>
15	1.66	
25	2.05	1.62
60		3.50
62	4.45	
98.5	8.18	
98/99		8.45

Note (a) Grams  $As_2O_3$  per 100 grams  $H_2O$

(b) Grams  $As_2O_3$  per 100 grams of solution having  
1M  $H_3AsO_4$ /litre

If the above solubilities are accepted at face value, the differential between 25 and 98.5° is 6.83 grams in the case of 1M  $H_3AsO_4$  versus 6.13 grams in the case of water. There is no data available on concentrations of  $H_3AsO_4$  less than 1 molecule per litre and it is in this area that interest might be centred to determine whether there is (a) greater solubility of  $As_2O_3$  at elevated temperature, and (b) improved differential solubility over a temperature range.

A copy of Linke's summary is attached for ready reference.

HTE:ld  
Att.

*H. T. Evans*  
H. T. Evans

# As ARSENIC

## 0 ARSENIC TRIOXIDE $As_2O_3$

### SOLUBILITY IN WATER (Anderson and Story, 1923)

Data in excellent agreement with these are given by Garrett, Holmes and Laube (1940) at 25°, Jozefowicz, Witekowa, and Zubranska (1950) at 25°, Schreinewakers and de Baat (1915) at 20° and 30°, De Carli (1932) at 20°, Bruner and St. Tolloczko (1903), and Chodounsky (1888) at 2°, 15°, 25° and 39.8°. The values of Rugg (1950) at 18° and Wood (1908) at 15° are too low, and that of Schnellbach and Rosin (1929) at 25° too high. For data on different modifications of  $As_2O_3$ , see below.

t°	Gms. $As_2O_3$ per 100 gms. $H_2O$	t°	Gms. $As_2O_3$ per 100 gms. $H_2O$
0	1.21	39.8	2.93
2	1.20*	48.2	3.43
15	1.66	62	4.45
20	1.81†	75	5.62
25	2.05	98.5	8.18
30	2.31**		

\*Bruner and St. Tolloczko, 1903;

†De Carli, 1932;

\*\*Schreinewakers and de Baat, 1915.

An "amorphous" modification has been reported by Winkler (1885), who gives its solubility as 3.7 gms. per 100 cc  $H_2O$  at ordinary temperatures, and 11.86 gms. at the boiling point. Margulis (1947), and Margulis and Gane (1947) extracted  $As_2O_3$  with water and found that their results could be explained on the existence of two forms of  $As_2O_3$  existing in the sample. The amount extracted depended upon the number of previous extractions and the amount of solid at the start.

### SOLUBILITY OF ARSENIC TRIOXIDE IN ACID SOLUTIONS (Chiron and Mangili, 1935; Garrett, Holmes and Laube, 1940)

These authors agree reasonably well on the solubility of  $As_2O_3$  in HCl solutions. The results of Wood (1908) at 25° are too low.

Data of Chiron and Mangili:

t°	Mols. Acid per liter	Gms. $As_2O_3$ per 100 gms. sat. solution in aq. sol. of:				
		$H_3AsO_4$	$H_3PO_4$	$H_2SO_4$	HCl	$HClO_4$
25	1.0	1.62	1.62	1.55	1.83	1.71
"	5.0	1.10	0.94	0.54	...	0.43
"	7.5	1.23	0.63	0.25	5.02	0.18
60	1.0	3.50	3.50	3.26	3.64	3.47
"	5.0	2.63	2.09	1.19	...	..0
"	7.5	2.10	1.57	0.78	15.43	0.42
98-90	1.0	8.45	8.46	7.27	...	6.69
"	5.0	5.08	4.51	2.62	...	1.88
"	7.5	4.36	3.02	1.48	25.92	0.84