FALCONBRIDGE NICKEL MINES LIMITED

INTER OFFICE MEMORANDUM

L. Price
Proposal

MEMO TO: R.A. Bergman

FROM: W.R. Hatch

DATE: October 19, 1978

SUBJECT: Purification of Arsenious Oxide from Giant Yellowknife

PROJECT No. 201-781019

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KEYWORDS: Baghouse dust, program

INTRODUCTION

The purification of arsenious oxide containing baghouse dust is currently under investigation with the purpose being to produce a high purity As_2O_3 product and a As_2O_3 free residue which can be treated for gold recovery.

Samples have been received at FML from tailings ponds at Con (FML#78-346). These samples were taken from different locations and depths(1). Previous discussion had outlined two basic approaches to the arsenious oxide purification: (1) hot water process taking advantage of the solubility difference of As_2O_3 in hot and cold water to crystallize out a pure product and (2) a vaporization method for roasting-condensing pure As_2O_3. A preliminary test has been carried out on a gravity separation method to upgrade the As_2O_3 and a more detailed study of the hot water process is underway. A literature survey has been carried out through Chem. Abs. for the years 1930 to 1976 covering As_2O_3 methods of purification.

EXPERIMENTAL

Samples were taken from one bag of drill samples, dried and submitted for spectrographic analysis. The analysis (Table I) showed that there was no detectable difference between these samples which represent the tailings pond. Chemical analysis gave values of 70.2% As_2O_3 and 0.82% Sb. The analysis of Con Basin material has been reported as follows:

	% Water	% As_2O_3*	% Gangue*
Con Basin	31.5	70.8	29.2

* dry basis

Preliminary tests have been carried out on the hot water process to assess the following:

1) solubility of As_2O_3 at 23°C and at 95°C.
2) purity of As_2O_3 crystallized product.

A 50 g sample of dry material (A-6011) was heated in 500 ml of water at 95°C for 2 hours. The solution was filtered hot through a hot filter and the solution retained for crystallization. The residue was washed with 200 ml of hot water and retained separately. The hot filtrate was cooled to room temperature in a water bath and allowed to stand 24 hours before filtering off the As_2O_3 crystals.

The results of the test were as follows:

	Amount	As_2O_3	Sb	Wt. g As_2O_3	Wt. g Sb
Head Sample	50.0 g	70.2 %	0.82 %	35.1	0.41
Residue, A-6100	21.4 g	59.6 %	1.8 %	12.8	0.39
Crystals, A-6102	9.0 g	99.3 %	0.4 %	8.9	0.036
Filtrate, A-6103	500 ml	29.4 g/L	0.028 g/L	14.7	0.014
Wash, A-6101	200 ml	14.6 g/L	0.029 g/L	2.9	0.006
Total				39.4	0.44

From this test, the solubility of As_2O_3 in water at 95°C is calculated to be 48 g/L which is considerably lower than that given by Seidell[2] reported to be as follows:

T °C	g As_2O_3 per 100 g H_2O
0	1.21
15	1.66
25	2.05
39.8	2.93
48.2	3.43
62.0	4.45
75.0	5.62
98.5	8.18

As a result, the yield of As_2O_3 crystals is low with 32% reporting to the residue.

The As_2O_3 crystals were of high purity and meet product requirements. The antimony did not dissolve to any appreciable extent due to its lower solubility in water.

The reasons for the low As_2O_3 solubility in water are currently under investigation. XRD examination of the residues from water leaching tests indicate that the form of arsenic present in the residue is arsenolite (As_4O_6) and of the same crystalline form as that which dissolved from the head sample[3].

A proposed program for further investigation is outlined as follows:

Stage I

Objective

To produce a high purity As_2O_3 crystalline product and a relatively As_2O_3-free residue for further treatment. Laboratory investigation will include the following:

a) Aqueous solubility, pH^+, redox relationships and dissolution rates of As_2O_3.
b) Impurity levels in recycle solution and methods for their removal.
c) Preliminary flowsheet.

Stage II

Objective

To leach gold from the residue from Stage I. Laboratory investigation will include the following:

a) Leaching tests in 1000 ppm CN^- in the presence of active carbon.
b) Direct cyanidization as per GYM process.

REFERENCES

(1) Brief description given in telex Giant YK-Falconbrij Tor to L.S. Price, Sept. 20/78.

(2) A. Seidell - Solubilities of Inorganic and Metal Organic Compounds.

(3) Phases in Giant Yellowknife Arsenic-rich Samples, J.E. Muir, 201-781018.

W.R. Hatch

WRH/bc

W.R. Hatch

TABLE I: Qualitative Spectrographic Analysis of As_2O_3 Tailings

Element	Range %
As	10-100
Fe	3-30
Si, Zn	1-10
Mg, Ca, Al, Sb	0.1-1
Pb, Ti	0.03-0.3
Cu, B, Au	0.003-0.03
Ni, Co	0.001-0.01
Mn, Bi, Ag	0.0003-0.003