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MINEMET RESEARCH,
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RAWMET ORE ROASTING

Project situation

Translated from French,

by Bernard J. Maurette,
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1 - PERFORMED ASSAY HISTORY

The assays, performed in order to test the attitude to ROASTING of the samples presented by the Rawmet firm, have been made on several products, the characteristics of which are grouped below:

Samples	Analyses					Gan gue %	Granulo metry D-80	Assays
	Co	As	S	Fe	Au			
Bulk	4.2	29	5.2	14.1	21 g/T	48	5 mm	Nov 84: Lab.:
Floatation concentrate	6.4	52.1	4.6	20.5	26 g/T	17	100 mm	May 85: Lab :
Ore	4.1	31.6	10.6	20.6	36 g/T	33	10 mm	Dec 85: Pilot:

Considering the product granulometry, the gangue percentage, and their analyses, (mainly S and As), we note that the assays were performed on three samples clearly different.

2 - ROASTING ATTITUDE

The components, off gangue, as evidenced by X-Ray Diffraction, are essentially (Co,Fe)As₂, FeAs₂ and FeAsS.

The exothermicity of these products is relatively weak, (between 0.7 and 0.8 Th/Kg) compared to that of Bourneix, (1.1 Th/Kg).

The total of results of the roasting assays are given in the diagram presented on the following page:

ROASTING ASSAYS

		Ore - Dec.85	May 85	Nov.84	
Regime		Selective	Oxidizing	Oxidizing	
700°C	Arsenic elimination %	68	67	-	71
	Sulfur elimination %	88	90	-	91
	Calcine analysis:				
	Co %	5.3	5.3	-	5.0
	As %	13.8	13.8	-	11.1
	S %	1.9	1.4	-	0.58
	Au g/T	-	-	-	-
	As ₂ O ₃ /T - in	284	280	-	271 kg
	Calcine/T - in	690	690	-	747 kg
	800°C	Arsenic elimination %	72	76	80
Sulfur elimination %		97	98	95	98
Calcine analysis:					
Co %		5.5	5.0	10.2	5.4
As %		12.4	12.0	16.4	10.4
S %		0.4	0.4	0.33	0.14
Au g/T		80.0	-	55.0	-
As ₂ O ₃ /T - in		300	317	550 kg	28
Calcine/T - in		670	610	650 kg	720

No fritting of the final bed has been observed in any assay.

Globally speaking, we see that the assays in selective regime (air/QS around 1) and in oxidizing regime (air/QS around 1, 3) are giving very close results and the best assays are those performed at 800°C.

The rather high content of arsenic in the calcines is due to the formation of cobalt arsenide, (CoAs₂), and of iron diarsenide (FeAs₂), which it is impossible to avoid with a mix of air/QS close to 1.

This mix point is difficultly improvable considering the weak exothermicity of the product.

Before discussing any further the characteristics of the calcines, it is necessary to recall the miner's objectives.

These were of two orders:

- 1 - to value the cobalt and gold contents, therefore to obtain as rich as possible calcines and eliminate as much as possible the arsenic and the sulfur.
- 2 - to value the Rare earth elements, therefor to recover them totally from the calcine.

The second objective has been achieved in our assays.

However, one must immediately remark that these two objectives are not compatible.

As a matter of fact, the aluminosilicate gangue, only phase carrying the Rare Earth elements, is evidently a nuisance to the enrichment of cobalt and gold in the calcine.

Moreover, the content value of the rare Earth elements being very low, (the total of their content in the bulk sample not exceeding 3%), the second objective does not seem well founded.

Consequently, the miner's interest is certainly to obtain a floatation concentrate cleared of its gangue and as rich as possible in cobalt and gold.

This study, to the scale of a few kilograms of the December 1985 sample, which, we know, is not representative of the real bulk ore, was assigned to MINEMET RESEARCH mineralurgists.

The objective is to establish the cobalt, arsenic and gold contents in the final calcine, which would be comparable with the contents of a representative concentrate.

This has been realised, (the report is being prepared).

The concentrate obtained from the December 1985 sample presents the following analysis:

	Co	Fe	As	S	Au	SiO ₂
Concentrate	6.4%	23.3%	44.4%	14.0%	55.0 g/T	0.8%

From our experience on the preceeding assays, the roasting of this product would give the following results:

	Air/QS	Temperature	Calcine Analysis in %					As ₂ O ₃ T.	Calcine T.
			Co	Fe	As	S	Au g/T.		
Roasting	1	800 C.	12.5	45.7	17.4	1.3	110	470 kg	510 kg

The arsenic trioxide (As₂O₃) production is acceptable.

The value of such a calcine is without doubt similar to the " BOU AZZER " calcine, which was treated with special metals.

We would, by all means, be interested testing at a pilot plan scale the roasting of a concentrate representative of the real bulk ore supplied by the miner or then floated by MINEMET RESEARCH.

We are now looking forward to receiving an answer from the miner on this matter.