



Bergvesenet

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Rapportarkivet

Bergvesenet rapport nr 7038	Intern Journal nr	Internt arkiv nr	Rapport lokalisering	Gradering
Kommer fra ..arkiv Kautokeino Kobberfelter A/S	Ekstern rapport nr	Oversendt fra Bidjovagge Gruber a.s.	Fortrolig pga	Fortrolig fra dato:
Tittel Kautokeino Kobberfelter: Flotation of Graphite Shale with Chalcopyrite and Pyrite, june 1960				
Forfatter Mortenson, Magne Hattrem, Thor		Dato År 28.06 1960	Bedrift (Oppdragsgiver og/eller oppdragstaker) Kautokeino Kobberfelter A/S USB	
Kommune Kautokeino	Fylke Finnmark	Bergdistrikt	1: 50 000 kartblad 18334	1: 250 000 kartblad Nordreisa
Fagområde Oppredning	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt) Bidjovagge		
Råstoffgruppe Malm/metall	Råstofftype Cu,			
Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse English translation of BV 7037 Test on oresample of graphitic shale with finely distributed chalcopyrite and pyrite. Nessecary grinding defined for batch testing. There are done 2 flotation tests: Flotation with natural pH, gac konc with 14,2% Cu and recovery of 86,7%. The second flotation test was done with lime basic pulp - lime added under grinding- This gave konc with 28,8 % Cu and recovery of 69,8%.				

Kautskvinn Sjøbrønnfeltet

Graphitic shale with chalcocopyrite and pyrite.

Result of flotation tests:

By flotation with "natural" pH a concentrate has been achieved containing 14,2 % Cu with a copper extraction of 66,7 %.

By flotation in a lime basic environment a concentrate has been achieved containing 28,8 % Cu with a copper extraction of 69,6 %.

The tests were conducted during March-May 1960. Later in the spring, until now, it has not been possible to reproduce the results obtained in the tests conducted in lime basic environment.

Ore Dressing Laboratory, June 28, 1960

Sign.

Flotation tests:

Ore sample: Graphite shale containing relatively finely dispersed chalcopyrite and pyrite.

Assay: 1.3% Cu, 4.7% S, 5.35% Fe, 17.7% C, 67.5% insoluble.

On the basis of the assay the following mineral composition can be calculated:

3.75% CuFeS_2 , 6.35% FeS_2 , 1.25% Fe in silicates, 17.7% C, and 67.5% insoluble, in total 96.55%.

Further:

Mineral	Assay	Prop.	Remarks
CuFeS_2	3.75%	37.1%	Of the sum of the silicates CuFeS_2 amounts to 37.1%.
FeS_2	6.35%	62.9%	The copper content in the sum of the sulfides is ca. 12.9%.

Grinding:

Grinding of graphite shale ore to 65 mesh product takes, under otherwise equal conditions, twice as long time in batch as the ordinary ore from Bidjovagge.

65 mesh grinding was employed in the batch flotation tests. The screen-curve for the ground product is seen in Fig. 1. According to the results obtained, this degree of grinding appears to be sufficient for the batch flotation tests, since the copper content of the tailing is then under 0.1%. The tailings from the batch tests show, however, under otherwise identical flotation conditions, quite large variations. The reason for this probably lies in that the chalcopyrite was not equally "finely divided" in all samples. The samples for the individual flotation tests are not usually splitted out. Because of the slight amount of chalcopyrite in the tailing with respect to the large amount of graphite shale, it is quite difficult to ascertain the degree of mineral liberation through microscopy without a special preparation of the tailing.

In the batch tests 150 g/t K-a-x was used to obtain tailing assays of approximately 0.1% Cu.

Pine oil, cresylic acid, and rexofrother were tested as frothers, see Fig. 2. The copper content in the tailing was independent of the frother used. The floated portion amounted to ca. 15-30% by weight and the least weight amount floated was with cresylic acid as frother. The remaining flotation conditions were constant.

An attempt was made to depress the graphite shale with reagents in Cyanamide's 600-series and with lignin sulfonate.

In pulp of "natural" pH with the addition of a depressing agent and involving up to 5 cleaner stages, a concentrate was obtained containing 12-15% Cu with 70-85% recovery. The tailing losses varied from somewhat under 5% to a little over 10%. The variations in the tailing assays are most likely caused by inconsistent dispersion of chalcopyrite in the individual samples. It was not found that the depressing agents employed for graphite shale depress the chalcopyrite in pulp with "natural" pH. In one test (51), without addition of a depressing agent and with 4 cleaner stages, there was obtained a concentrate with 9.6% Cu and 88% recovery. By adding a depressing agent in the fifth cleaner stage the assay of the concentrate rose to 14.2% Cu and the recovery fell to 86.7%, see Fig. 3. This last mentioned concentrate contained 8% C, which amounts to an extraction of 3% in the ore.

Assay of the concentrate gave:

14.2% Cu	31.6% Fe
35.2% S	8.0% C
9.7% insoluble	

The following mineral composition of the concentrate can be calculated:

41.0% CuFeS_2	39.0% FeS_2
1.0% Fe in silicates	
8.0% C	9.7% insoluble

In lime basic pulp (the lime was added during grinding) with addition of a depressing agent for graphite shale, a considerable increase in the copper content of the cleaned concentrate was obtained in comparison to pulp with "natural" pH. For the most part this increase in assay is due to the fact that pyrite is

depressed in a lime basic environment. Flotation test (28), Fig. 3, a concentrate with the following assay was obtained with addition of lime during grinding and with addition of graphite depressor agent in all cleaner stages:

28.2% Cu	26.6% Fe
30.7% S	4.9% C
6.7% insoluble	

On which basis the following mineral composition can be calculated:

23.1% CuFeS_2	3.0% FeS_2
6.9% C	6.7% insoluble

Extraction of Cu in this concentrate was ca. 70%.

In other tests under similar conditions, the concentrate assay has been between ca. 24% and ca. 30% Cu. The extraction in this cleaned concentrate has been between ca. 70% and ca. 80% and tailing losses between ca. 5% and ca. 10%. In test 51 the tailing loss was 10.7%. The highest tailing losses in lime basic environment are also probably due to the variation in dispersion in the chalcopyrite in the various test samples.

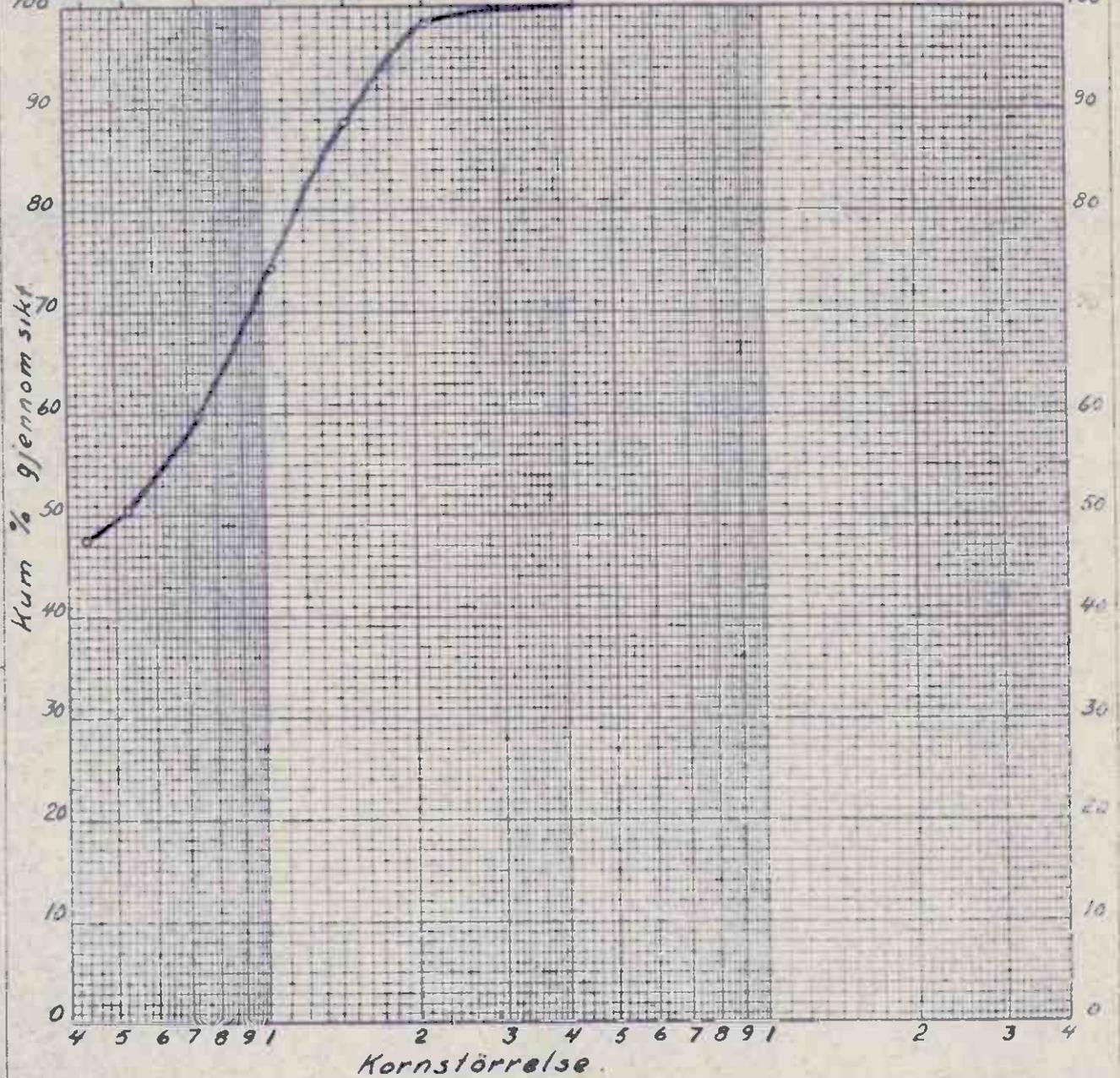
The tests were conducted in March, April, and the beginning of May. At the end of May and in June the possibility of depressing graphite shale in lime basic pulp without the use of any special depressing agent was tested. The tests were negative. At the same time tests were also carried out to determine the reproducibility of the earlier tests involving depressing of graphite shale in lime basic environment with a special depressing agent. Reproduction has not so far been possible.

Cro Dressing Laboratory, June 1960

Sign.

Siktepröve av: Käfttorkning, Långsigt, ...
 Grafski-er "Långsigt, m. f. f. f.
 Utfört 17/2 - 19.69. Signatur: F.V. Th.

% 0004 0053 0074 0104 Lysåpning för använt sikt föres på her. mm → % 100



Fraksjon		#1			#2			Lysåpning	
-	+	g	%	lin%	g	%	lin%	Batch no	
∞	0.42	00		1000			1000		
0.40	0.21	025	18	982	025	12	983	95 kg malm	
0.20	0.147	130	96	886	135	33	890	20 g pulver	
0.147	0.104	195	44	742	210	44	746	85 l vann	
0.104	0.074	200	148	594	210	144	602	Malt-vd 75 min	
0.074	0.053	120	89	505	140	96	506		
0.053	0.044	045	33	472	045	31	475		
0.044	0.0	640	472		645	475			
Differens:									
Total:		12.55	100.0		14.60	100.0			

Gra-175 Ki der m/ kobber- og 5 advisér 5

3/5 mm etc.

% over 1 meter

100
90
80
70
60
50
40
30
20
10
0

Geth. % i a. i. a. g.

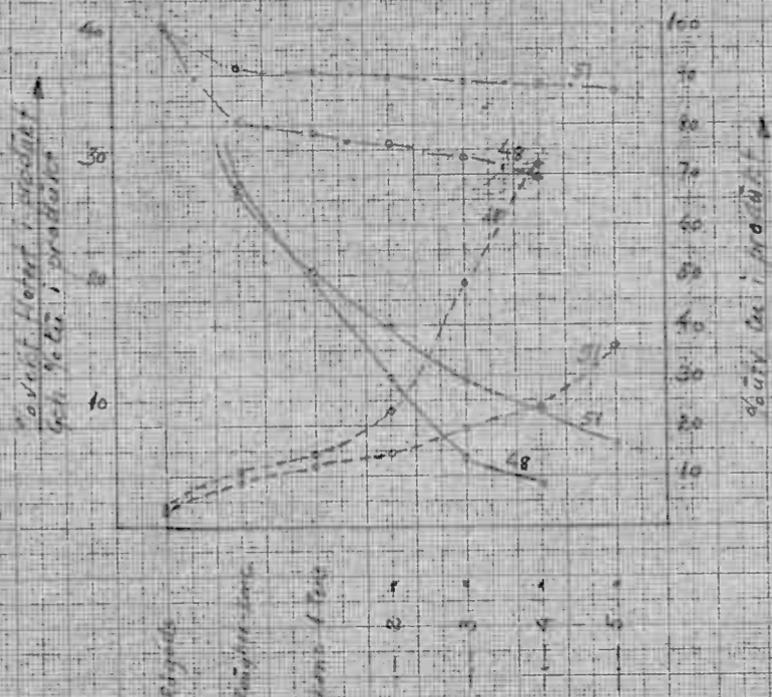
0.4
0.3
0.2
0.1
0

Samlet	K-a-x	K-z-x	K-a-x	K-a-x	K-a-x	K-a-x	konst.
Stammer	PO	Pexo	Cresyl	cresyl	kaik	kaik	
F.m.	53	54	55	56	48		

Opredningslaboratoriet
Juni 1960

71

Greittskifer ⁷⁰ kvæder og svovls



— Procent fluor i produkt
 - - - Geh. % Cu i produkt
 - · - Geh. % Cu i produkt

Opregnsningsrapport
 juli 1960

Lautokaino Kobber-eller

Blag 3

Grafit-skifer m/ Kobber- og Svelkis.

Forsøk		Vekt		Geh		avr. Cu		Anmerkninger
No	Produkt nrk	g	%	% Cu	g Cu = 100	%		
48	kk Gr 48 Ck 4R	52.0	34	28.8	1497.60	69.8	3 charger a 50g med emalt med hver 2,5g CaO. Fløret hver for sig med 120g r k-a-x + 2 dr. 2.0 fløret slått sammen m løsning 1. rusestinn 50% ligninsulfonat 2, 3. og 4. rusestinn 5% ligninsulfonat	
	A1R	110.0	7.2	0.53	58.20	2.7		
	A2R	118.0	7.7	0.46	54.28	2.5		
	A3R	100.0	6.6	0.57	57.00	2.6		
	A4R	29.0	1.9	2.78	80.62	3.7		
	A	1117.0	73.8	0.36	402.12	18.3		
		1526.0	100.0	1.41	2149.98	100.0		
51	kk Gr 51 Bk 4R	95.0	6.3	14.2	1349.00	86.7	3 charger a 50g med emalt, fløret hver for sig med 120g r k-a-x + 2 dr. Rusestinner Fløret slått sammen rusest 4 charger uten tilset 5. rusestinn tilset 50% ligninsulfonat	
	A1R	90.0	6.0	0.19	17.10	1.1		
	A2R	65.0	4.3	0.19	12.35	0.8		
	A3R	65.0	4.3	0.25	16.25	1.0		
	A4R	34.0	2.2	0.34	8.16	0.5		
	A5R	47.0	3.1	0.44	20.68	1.3		
A	1117.0	73.8	0.12	134.04	8.6			
		1513.0	100.0	1.03	1557.58	100.0		

¹⁾ Beregnet fra vekt og analyse

GDondningslaboratoriet
21/11 1960

H.