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Antoaneta BOTEVA*

ADDITIONAL COLLECTORS IN COPPER-MOLYBDENUM-PYRITE ORE FLOTATION

It is believed that additional collectors used in the copper-molybdenum-pyrite ore flotation exhibit an additive collecting action towards copper minerals, molybdenite, and pyrite. Our investigations showed that the additional collectors rather have independent influence on the flotation process.

INTRODUCTION

In specialised literature the use of additional collectors in flotation of metal ores is considered as a method for enhancing the action of the main collector (Boteva 1983, 1992). The reason for enhancing the hydrophobization effect of the basic collector is, for instance for oil emulsions used as the additional collector, the interaction between the hydrocarbon molecules of the oil and the hydrocarbon radicals of the main collector. It is also known that thiophosphates and thiocarbamates used as additional collectors provide comparable results at lower consumption of the basic collector and give improved selectivity of the flotation process. In the present study an independent role of the additional collector in the flotation process applied on an industrial scale will be discussed.

EXPERIMENTAL

Porphyry sulphide copper-molybdenum-pyrite ore was chosen for the study. Isobuthyl xanthate was used as principle collector. The following additional collectors in the laboratory and plant tests were used: oil emulsified in isobuthyl xanthate, kerosene emulsified in aqueous solution of sodium carbonate, mixtures of normal paraffins and alkylsulphonates, aqueous solutions of polyoxyethylene.

* University of Mining and Geology, Sofia, Bulgaria.

RESULTS AND DISCUSSION

The aim of the tests was to increase the recovery of copper at limited recovery of pyrite. An increased recovery of gold in the copper concentrate along with a high recovery of molybdenite in the molybdenum concentrate was also expected.

The results of the laboratory and plant scale flotation tests showed that

1. The use of kerosene emulsified in the sodium carbonate aqueous solutions provide lower (by 12.5%) loss of molybdenum in the rough flotation tailing, lower loss of Mo in the copper concentrate as well as in the tailings of the scavenging flotation from the first cleaning the pyrite flotation and pyrite concentrate (by 0.57%) (Table 1),

2. The use of oil emulsified in xanthate increases the recovery of sulfur by 0.8% (Table 2),

3. The addition of aqueous solution of polyoxyethylene in the milling stage raises the molybdenum recovery by 2.3%,

4. The use of a mixture of normal paraffins and sulphonates resulted in an increase in the gold content of the copper concentrate by 1 g/t.

Table 1. Results of plant flotation in the presence and absence of kerosene (emulsified in a sodium carbonate) as the additional collector

	Containing kerosene (emulsified in sodium carbonate)	Without kerosene
Mo content in ore, %	0.0157	0.0157
Mo content in rough concentrate, %	0.136	–
Mo recovery rough concentrate, %	69.86	57.3
Mo content in tailing, %	0.0049	0.0069
Mo losses in tailing, %	30.14	42.70
Mo losses pyrite concentrate, %	6.85	7.42
Mo recovery in Mo-concentrate, %	45.96	35.11
Mo content in Mo-concentrate, %	41.29	37.65

Table 2. Results of plant flotation in the presence and absence of oil emulsified in xanthate, figures indicate recovery, %

	Product	Cu	Mo	S	Cu	Mo	S
	rough concentrate	4.01	0.127	12.25	90.42	76.48	89.13
With oil	tailing	0.037	0.0037	0.13	9.58	23.52	10.87
	feed (ore)	0.355	0.0133	1.10	100	100	100
	rough concentrate	4.01	0.117	12.81	88.57	71.21	88.35
No oil	tailing	0.045	0.0041	0.147	11.43	28.79	11.65
	feed	0.362	0.0131	1.16	100	100	100

CONCLUSIONS

A comparison of the data obtained with and without additional collectors indicates that they play an independent role in relation to the main collector when the main collector is not capable to ensure the recovery of the difficult-to-float particles. In such a case it is possible to improve the recovery by the use of additional collector which probably increase the flotation of fine particles and particle intergrowths (Weiss 1985).

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Uważa się, że dodatkowe kolektory stosowane we flotacji rud miedziowo-molibdenowo-pirytowych wykazują działanie addytywne w stosunku do minerałów miedzi, molibdenitu i pirytu. Przedstawione w tej pracy wyniki badań z zastosowaniem oprócz ksantogenianu izo-butylowego dodatkowych kolektorów, takich jak olej emulgowany w ksantogenianie, ropa emulgowana w wodnym roztworze węglanu sodu, mieszanina normalnych węglowodorów parafinowych i alkilosulfonianów, wodny roztwór tlenku polietylenu wykazały, że działają one niezależnie.