

COMPLEX MINERAL RECOVERY FROM THE COPPER FLOTATION TAILING

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ABSTRACT

The generally concept of the carried out investigations is discovering an appropriate technological scheme of the possible complex mineral utilisation from the copper flotation tailing. The Bucim - mine laboratory investigations of the flotation tailing are based on the demands of the possible complex recovery from the useful present minerals or mineral components: CuFeS_2 ; FeS_2 ; Fe_2O_3 ; Fe_3O_4 ; Na-feldspar and K-feldspar; SiO_2 etc.

KEY – WORDS: Recovery, chalcopyrite, pyrite, potassium feldspar, sodium feldspar, quartz, hematite, magnetite, aqueous solution, flotation, magnetic separation,

INTRODUCTION

Bucim copper and gold mine is the unique mine in the Republic of Macedonia located in the southern part of country on the south-west slopes of the Plackovica mountain. The mine is situated 130 km from the Republic capital-Skopje, 13 km from Radovis, and 2,5 km from the road connecting Stip with Strumica. The unique copper mineralization of a porphyritic type is occurring in the gneisses to their contact with the andesites. The mineral content decreases gradually with increasing distance from the contact and occurs principally as fillings and coatings on fracture planes. Andesites are barren in general, however, copper mineralization associated

with fractures and joining is found in the andesites as well.

After 1979 the first tones of the copper concentrate are produced. Since that time to nowadays the Bucim mine permanent has realised a good production - financing results including itself in the leader country company. Mine of the open type is the basis characteristic of the Bucim mine. The mine is equipped with modern mechanisation making possible about the high productivity and good operating conditions for the operators. The process includes drilling and blasting, then blasted ore is transported towards primary crushing while the tailing on the mine disposal. The Mineral Processing and ore concentration cover the following operations: primary, secondary and tertiary crushing, screening and storing, grinding and classification, flotation, regrinding, thickening and filtering and finally the tailing removal in tailing pond. Final product is the copper concentrate consisting 20% Cu, 21 g/t Au and 25 g/t Ag, with following recoveries: 88% for copper, 60% for Au and 35-40% for silver.

THE LABORATORY INVESTIGATIONS

The investigation should be to serve as a basis of the invention by possibilities for the increased both copper recovery and copper grade in the concentrate and the decrease gross consumption of the lime, as well as.

The optimization of the technological process in these techno-laboratory experiments has understood that collective flotation of the

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chalcopyrite and pyrite have to operate by lower values of the pH, at the same time making possibilities of the increased recovery of the copper, gold, silver and pyrite, decreasing the lime consumption, decreasing of the incrustations appearing and protecting environment. Also, these laboratory tests have enabled to prove the optimum conditions of the process of collective flotation at the lower pH-values.

The samples from the Bucim-mine were with average copper content of 0,17-0,23%Cu. The bench-scale tests from the collective flotation were made of the copper minerals and pyrite, depending on values of pH, the pulp densities and the reagents consumption using the same conditions to determine the optimal conditions for extraction of rougher collective concentrates and scavenger collective concentrates, according to the following schemes of the complex mineral recovery (Fig 1; Fig 2).

Concerning the previous laboratory tests from the effects of the various factors on the technological indicators of the collective flotation of the copper minerals and pyrite were carried out using the different pH-values effecting on the flotation kinetic. The conducted investigation has had aim to ensure collective flotation by chalcopyrite-pyrite from Bucim copper mine ensuring the possibilities of the increased copper recovery contemporary decreasing both the lime consumption and incrustation appearing and protection of the environment.

The worked out equation about the kinetic of the flotation process, according to the Agar equation provides the following form equations for different pH-values by pH=7 and pH=8.

pH=7

$$R_{(t)} \Rightarrow 0,861.(1-e^{-0,00388(t+116,36)})$$

pH=8

$$R_{(t)} \Rightarrow 0,855.(1-e^{-0,0035(t+93,9)})$$

CONCLUSION

It's evident advantage of the achieved results by "short" term bioleaching on the standard conditions for the porhiritic type of ore relating to the conventional selective chalcopyrite flotation using standard (KEX or NaIPX) or new reagent regime (Orfom and Penflot).

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