INTRODUCTION

In Serbia, the polymetallic off-bank ore that contains copper, zinc, gold and silver occurs in quantities that meet even exceed Fe needs of the country. Deposit of the complex polymetallic sulphide ore deposit "Bobija" located in western Serbia consists of several orebodies of different morphological and structural texture differentiation. Polymetallic paragenesis is mostly formed of sulfides with a huge content of pyrite. There are lead, zinc and copper with addition of silver, antimony, gold, silver, chalcopyrite, pyrite, molybdenite and galena. An analysis of the massive sulfide ore samples has shown a high content of the basic metals (>10% Zn and Pb) as well as the precious metals contents.

Bioleaching – a selective leaching process that has been demonstrated for commercial purposes. Use of genetically modified bacteria may promise a commercial alternative to the conventional pyrometallurgical processing methods.

RESULTS AND DISCUSSION

In previous experiments it was shown that without adaptation of the mixed culture, maximum recovery of 83% Cu and 89% Zn could be achieved over period of 40 days, with around 60% Fe extraction achieved (5). In subsequent experiments, a bacterial culture adapted to grow on the concentrate was used in the bioleaching experiments (6). Bioleaching of a polymetallic sulphide concentrate (from the Bobija open pit, Ljubovija, west Serbia) was carried out at 30°C in three aeroagitated reactors in the presence of the adsorbed alternative mixed bacterial culture, containing Acidithiobacillus ferrooxidans, Acidithiobacillus thiooxidans, and Leptospirillum ferrooxidans, with the addition of heterotrophic acidophilic culture Acidiphilium triviale, TB-11 which are known to be efficient oxidizers of copper and iron sulfides in the presence of glucose and other organic compounds. The reaction conditions: pH of 1.8, 40°C, pulp density 15% (w/v) were used, and the pulp density of 15% (w/v). It was shown that a combination of acid and alkaline was more effective in higher Cu and Zn recovery (6). Fe extraction is significantly lowered by using this process, Cu and Zn losses were substantially lower as a result of the combination of concomitant processes of copper leaching and iron co-precipitation can be controlled and iron co-precipitation be treated by solvent extraction and electrowinning.

Keywords: Polymetallic, two-stage leaching, bioleaching, Acidithiobacillus ferrooxidans

CONCLUSION

Using a combination of acid and bioleaching, it was demonstrated that current Cu and Zn recoveries could be achieved than using only bioleaching or bioleaching followed by acid leaching. Since the Fe extraction is significantly lower using this process, it is expected that the Cu and Zn losses will be substantially lower as a result of Fe precipitation.

The solutions obtained by chemical leaching, were considered to be more concentrated and, after concentration treatment, could be treated by solvent extraction and electrowinning.

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REFERENCES


Figure 1 – Cu, Zn and Fe recovery vs. time (with pulp density of 10% (w/v)).

Figure 2 – Combination of the bioleaching and acid leaching with the air addition.