

FLOTATION CONCENTRATES OF POLYMETALLIC SULFIDES FROM SERBIAN ORE DEPOSITS AS BIOHIDROMETALURGICAL SUBSTRATES: LABORATORY TESTS

Jelena S. Avdalović^{1,4}, Vladimir P. Beškoski^{2,4}, Srdjan B. Miletić^{1,4}, Biljana P. Dojčinović^{1,4}, Vlastimir Trujić^{3,4}, Vesna Conić^{3,4}, Miroslav M. Vrvic^{2,4,a}

¹Department of Chemistry, Institute of Chemistry, Technology and Metallurgy, Belgrade,

²Faculty of Chemistry, University of Belgrade, Belgrade,

³Institute of Mining and Metallurgy, Bor, ⁴Center for Biogeotechnology, Bor, Serbia

^aCorresponding Author: mmvchem@sezampro.rs

There are three ore deposits of polymetallic sulfide ores that are of economic value in Serbia. Only ore deposit "A" (in central part of Serbia) is mine in exploitation (underground and surface), including and floatation plant. Dominant ore minerals at deposit "A" are: galena, sphalerite and chalcopyrite, with accompanying pyrrhotite, and some arsenopyrite. Lead, zinc and copper concentrates are obtained in particular. Approximately three million tons of reserves have been confirmed at deposit "A". About one million tons of reserves have been confirmed at ore deposit "B", which is located in Eastern Serbia. Important ore minerals at this deposit are: chalcopyrite, enargite, sphalerite and galena. Accompanying mineral is pyrite including pyrrhotite. Ore deposit "C" is located in Western Serbia, and has confirmed reserves of more than one million tons. Galena (with some anglesite), sphalerite and tetrahedrite are dominant ore minerals, and pyrite as accompanying mineral. Ore deposit "C" has legitimately exploitative amounts of industrial mineral barite. All three sites have significant amounts of silver, while deposit "B" has gold as well.

This paper presents preliminary results of bacterial leaching of flotation concentrates from afore mentioned ore deposits obtained by shake flask test technique during four weeks, with pure culture of acidophilic and mezophilic allochthonous strain of the *Acidithiobacillus* sp. B2 (the isolate was identified using the EzTaxon server on the basis of 16S rRNA sequence data). Deposit "A" was tested, in this investigation step, only for copper concentrate while other two deposits were examined polymetallic bulk concentrates (obtained in pilot flotation plants).

Based on the metal concentration in the solution from "A" chalcopyrite concentrate bioextraction is about 16 % of copper. Concentration of copper and zinc in solution (lead is insignificant due to deposition of lead sulfate) from "B" and "C" show leaching of copper from approx. 21, *i.e.* about 65 % and for zinc about 70, and *cca.* 67 %, respectively.

First results show that all three flotation concentrates of polymetallic sulfides are potential substrates for biohydrometallurgical processes in application, which will be further thoroughly examined in testes that are currently being undertaken.

References

1. B.C. Patel, M.K. Hinte, D.R. Tipre, A. Pillai, S.R. Dave, A novel biphasic leaching, approach for the recovery of Cu and Zn from polymetallic concentrate, *Biores. Technol.* **157** (2014), 310-315.
2. J.S. Jekić, V.P. Beškoski, G. Gojgić-Cvijović, M. Grbavčić, M.M. Vrvic, Bacterial generated $Fe_2(SO_4)_3$ from pyrite as leaching agent for power plant electrofilter ash from lignite combustion process, *J. Serb. Chem. Soc.* **72** (2007) 615-619.
3. J. Avdalović, V. Beškoski, G. Gojgić-Cvijović, M.-L. Mattinen, M. Stojanović, S. Zidžović, M.M. Vrvic, Microbial solubilization of phosphorous from phosphate rock by iron-oxidizing *Acidithiobacillus* sp. B2, *Miner. Eng.* **72** (2015) 17-22.