

# TEST OF MICROBIAL TRANSFORMATION OF FLOTATION TAILINGS TO CONSTRUCTION MATERIAL

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The use and recycling of secondary raw materials increases resource efficiency. An interesting option would be the use of flotation tailings in the production of building materials. One of challenges is the content of mobilizable metals in the residues for ecological quality reasons of building material. Since flotation residues contain low metal concentration they are suitable for bioleaching approaches.

The aim is to bioleach base metals from flotation residues to match the raw quality parameters for building material. Quantitative chemical data of the feed material and pregnant liquor were acquired from all experiments by ICP-MS (Perkin Elmer ELAN 9000).

Flotation residues were taken from “Żelazny Most” (Poland). The used microorganisms are *Yarrowia lipolytica* (yeast) with a culture media containing (g/L):  $\text{KH}_2\text{PO}_4$  7;  $\text{Na}_2\text{HPO}_4$  2.5;  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  1.5;  $\text{CaCl}_2$  0.15;  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  0.15;  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  0.02;  $\text{MnSO}_4 \cdot \text{H}_2\text{O}$  0.06; yeast extract 0.5; glycerol 60, and *Thiobacillus thioparus* (bacterium) media with  $(\text{NH}_4)_2\text{SO}_4$  0.1;  $\text{K}_2\text{HPO}_4$  4;  $\text{KH}_2\text{PO}_4$  4;  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  0.1;  $\text{CaCl}_2$  0.1;  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  0.02;  $\text{MnSO}_4 \cdot \text{H}_2\text{O}$  0.02;  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  10. The yeast was grown at 37°C and bacteria at 30°C.

The bioleaching was performed with a solid content of 5% in overhead shakers at 22°C for 7 days. Growing culture and culture broth were used as leaching agents.

Leaching the flotation residues with cultural broth of *Y. lipolytica* 5 to 20 times more metal, Cu and Pb, respectively, could be leached than with growing culture of *Y. lipolytica*. The results with *T. thioparus* show only a low mobilization. One reason for that observation may be the short incubation time.

The leaching results show the possibility to mobilize base metals from flotation residues. The quality requirements of construction material for Cu, Pb, and Zn could be matched after leaching with cultural broth of *Y. lipolytica*.

**Key words:** Secondary Raw Materials, Flotation Residues, Base Metals Bioleaching, *Yarrowia lipolytica*