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Evaluation of mineral processing techniques to concentrate metals (Pb, Zn, Cu, Au) in mining residues at Baia Mare, Romania

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Rehabilitation of historical mining sites is a great matter of concern in the world. In European countries, under 2006/21/CE Directive, national inventories were performed and dedicated management regarding environment and sanitary issues proposed. Mining residues are usually present on these sites; depending on their type and nature, they can be in particular source of acid and metallic drainage.

More recently economic circular issues have listed mining waste as possible secondary resources containing metals and materials. Their reprocessing could be of some interest especially if strategic or critical elements are present. Benefit could then help rehabilitation purpose.

At Baia Mare, Romania, polymetallic sulphide mine produced Pb, Zn, Cu. In particular the Central flotation pond operated for 13y (1962-75) to stock 8.5 Mt (5.7 Mm³) of residues. It is now located in an urban area with need of management.

A technical program was established to: 1) prepare representative samples and characterise them - chemical/ mineralogical composition, acid potential, particle size and metal distribution; 2) evaluate the possibility of concentrate metals by physical separation techniques to facilitate the leaching step.

The tailings consist of fine materials (d₅₀: 73 µm) rich in quartz with silicates, carbonates, sulfides and sulfates. Metals are Pb, Zn, Cu (<1%) and Au (0.6-0.7 ppm). Gravity separation using laboratory Mozley table showed a slight concentration of base metals within the heavy fraction but Au is disseminated in all size-fractions. Further separation tests are planned and Au speciation will be studied.

Further experiments will concern hydrometallurgy by testing thiosulfates and ionic liquids.

NB: The study is performed under MINTECO project (2018-20) with Eramin2 cofunding.