Chemical and biogenic organic acid leaching of low-grade, polymetallic primary ores and secondary industrial residues

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Europe does not possess vast, easily accessible deposits containing critical and economically valuable metals. However, it does have substantial amounts of low-grade, polymetallic primary ores and secondary industrial residues (tailings, sludges, slags and dusts), which contain significant concentrations of various metals.

A broad screening of metal recovey from these materials is presented for metal recovey of Zn, Cu, Cr and Ni. First using sysnthetic organic chelating organic acids (citric acid, gluconic and oxalic acid) as chemical analogues to those produced *via* microbial heterotrophic respiration. Followed by application of biogenic organic acids produced by relatively benign yeast cultures of *Candida Viswanathii* and *Saccharomyces Cerevisiae*.

An extensive fractional factorial design of experiments (DOE) for fast track screening, evaluation and optimization of bioleaching phenomina is presented. Testing pulp density, mixing speed (50 – 150 rpm), various mixtures of citric, gluconate and oxilate acids, leaching time (3 – 20 hrs) and organic acid concentrations (50 – 150 mM). Based on best case bioleaching, further process and rudimential modelling of bioleachig kinetics and mass transfer are also discussed.

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