

Evaluating the potential of bioleaching of gallium from bauxite residue by oxalic acid

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The world economy is confronted with an increasing supply risk of 'critical' strategically important metals such as gallium (Ga). These are defined as materials with a high supply risk and an above average economic importance compared to other raw materials. In the search for alternative sources, bauxite residue may offer potential. Bauxite residue, commonly known as red mud, is a major by-product of the aluminium industry, with an annual global production of 150 million tonnes and a total inventory of more than 2.7 billion tonnes. Depending on the source, bauxite residue can contain considerable amounts of valuable elements including Ga and its extraction may be economically feasible. This research, therefore, discusses the possibility of recovering Ga from bauxite residue. Oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$), a small molecular weight organic acid that can be biologically produced, was studied as a green alternative for the extraction. The most efficient extraction was achieved using the following parameters: 2.5 M $\text{H}_2\text{C}_2\text{O}_4$; 21.7 h contact time, 80.0 °C and 10.0 g/L slurry concentration with continuous shaking on 250 rpm. Using these optimal conditions, 80% of the aqua regia accessible Ga content was extracted in bauxite residue.