Potential of microbial diversity for mobilization of rare earth elements from red mud
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Abstract
The group of seventeen elements the oxides of which are popularly known as rare earths are characterized by an exceedingly close relationship in their chemical and physical properties, a relationship which in its intimacy is not paralleled by any other group of elements. On account of these unparalleled properties, rare earths have become significantly crucial in many fields and their extraction from many industrial wastes is an absolute necessity of time.

Current study deals with bio-assisted leaching of rare earths from red mud. Potential of microbial diversity was evaluated for organic acid production and concomitant leaching of rare earths. Biogenic metabolites production was higher in fungal compared to bacterial cultures with an increase in bioleaching efficiency. Main lixiviants produced in one step bioleaching were citric (12 mM), oxalic (2.5 mM), tartaric (1.8 mM) and gluconic acids (1162 mM) whereas they were citric (15 mM), oxalic (1 mM), tartaric (0.5 mM) and gluconic acids (152 mM) in two step bioleaching. Whilst in the spent medium, 63 mM citric acid, 29 mM oxalic acid and 23 mM tartaric acid were observed. Approximately 68% Sc, 79% Y, 28% La, 28% Ce, 35% Nd and 42% Sm were leached out in one step bioleaching. In the spent medium leaching 60% Sc, 63% Y, 28% La, 28% Ce, 35% Nd and 35% Sm were extracted. Approximately 55% Sc, 67% Y, 20% La, 15% Ce, 27% Nd and 45% Sm were bioleached in two step leaching mode. Insignificant mobilization of metals (1-5%) was observed in abiotic controls.

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