

Environmental applications of biotechnology in mining

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Bioprocessing of low-grade ores and concentrates is well-established as a commercial-scale technology for extracting value from various base and precious metal minerals. Microorganisms are also increasingly being used for recovering value from mine wastes and end-of-life consumer products such as batteries and electronic wastes. The capability of microbes to catalyse oxidative and reductive bioprocesses as well as degrade organic compounds has been utilised for the removal of various contaminants from hydrometallurgical process waters and the treatment of effluents prior to release into the environment. Biological iron oxidation, bioreduction of nitrate, selenate and sulfate, neutralisation of acidity with biogenic alkalinity and bioprecipitation of metals offer alternatives for chemical water treatment. Emerging technologies, such as bioelectrochemical systems and synthetic biology are also opening new avenues to mining companies for monitoring and mitigating environmental impacts. This paper reviews examples of recent developments in the environmental applications of biotechnology in mining.