

Application of Extremophile Microorganisms in Bioremediation of Mining Wastes for Their Sustainable Management

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ABSTRACT

In view of the continuous depletion of natural mineral resources, the high cost of exploration, and increased universal applications, a sustainable methodology needs to be developed for extracting minerals from alternate sources. Precious minerals recovery from mining wastes by conventional chemical and pyro-metallurgical methods is extremely expensive and has negative impacts on the environment. Bioleaching is an eco-friendly technique that employs specialized microorganisms to extract metals from their ores and secondary resources. The efficiency of these novel microbial strains can be optimized to advance mining waste remediation and promote resource recycling. A molecular-level understanding of microbial-mediated processes is essential for the exploitation of novel microorganisms for similar applications. A detailed molecular understanding of microbe-driven processes is crucial for utilizing novel microbes in similar applications. The mineral bioleaching ability of these microorganisms illustrates an essential part of further exploration for metal recovery and recycling from various sources. In the current scenario, the application of bioleaching concentrates on cost-effective and eco-friendly recovery of precious metals from mining and industrial wastes. Currently, bioleaching emphasizes the cost-effective and sustainable recovery of precious metals from industrial and mining waste. Greener technologies are considered a novel archetype that endures financial progress and safeguards environmental sustainability at the same time.

Keywords: Mining, Waste, Pollution, Bioleaching, Metal Recovery, Sustainability

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