

Application of Microbially Induced Calcite Precipitation Technology in Construction Materials: A Comprehensive Review of Waste Stream Contributions

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Abstract : Waste generation is a growing concern in many countries across the world, particularly in urban areas with high rates of population growth and industrialization. The increasing amount of waste generated from human activities has led to environmental, economic, and health issues. Improper disposal of waste can result in air and water pollution, land degradation, and the spread of diseases. Waste generation also consumes large amounts of natural resources and energy, leading to the depletion of valuable resources and contributing to greenhouse gas emissions. To address these concerns, there is a need for sustainable waste management practices that reduce waste generation and promote resource recovery and recycling. Amongst these, developing innovative technologies such as Microbially Induced Calcite Precipitation (MICP) in construction materials is an effective approach to transforming waste into valuable and sustainable applications. MICP is an environmentally friendly microbial-chemical technology that applies microorganisms and chemical reagents to biological processes to produce carbonate mineral. This substance can be an energy-efficient, cost-effective, sustainable solution to environmental and engineering challenges. Recent research has shown that waste streams can replace several MICP-chemical components in the cultivation media of microorganisms and cementation reagents (calcium sources and urea). In addition to its effectiveness in treating hazardous waste streams, MICP has been found to be cost-effective and sustainable solution applicable to various waste media. This comprehensive review paper aims to provide a thorough understanding of the environmental advantages and engineering applications of MICP technology, with a focus on the contribution of waste streams. It also provides researchers with guidance on how to identify and overcome the challenges that may arise applying the MICP technology using waste streams.

Keywords : waste stream, microbially induced calcite precipitation, construction materials, sustainability

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