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***COST-EFFECTIVE MICROBIALLY INDUCED CALCITE
PRECIPITATION FOR BIOCEMENT PRODUCTION
USING LOW-COST NUTRIENTS AND CALCIUM
SOURCES***

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Abstract: Biocement production via microbially induced calcite precipitation (MICP) offers a sustainable alternative to conventional cement. Reducing production costs by using low-cost nutrients and calcium sources is key to its large-scale applicability.

Urease-producing bacteria enable MICP by converting urea into carbonate ions that combine with calcium to form calcium carbonate. To obtain a significant amount of bacterial biomass for effective biocementation, a certain amount of nutrients is required, including sources of carbon, nitrogen, phosphorus, and minerals. Using low-cost substrates such as kitchen waste, food industry by-products, and agricultural residues can diminish production costs while providing essential nutrients for bacterial growth.

Calcium ions are crucial for MICP, as they react with bacterially produced carbonate ions to form calcium carbonate, which precipitates in pores under alkaline conditions and strengthens the material. Affordable calcium sources, including eggshells, shellfish waste, and other industrial by-products, can substitute expensive reagents (Yan, 2025).

MICP can produce sustainable biocement when low-cost nutrients and calcium sources are used. This approach reduces production costs while maintaining material performance.

Key words: *biocement, MICP, calcium sources, low-cost nutrients, urease-producing bacteria*

Bibliography: Yan, Z., Nakashima, K., Takano, C., & Kawasaki, S. (2025). Strategies for cost-optimized biocement production: a comprehensive review. *World Journal of Microbiology and Biotechnology*, 41(2), 67. <https://doi.org/10.1007/s11274-025-04281-2>