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Effective microbial calcite precipitation by a new mutant and precipitating regulation of extracellular urease

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Abstract

Microbial calcite precipitation is a promising and environmental friendly biological technology in remediation of the surface and subsurface of porous media, especially for in-situ soil remediation. The present study isolate a urea-degrading strain LH1 from soil on soybean root, identified as *Bacillus niabensis* strain (99% similarity) by 16S rRNA gene sequencing analysis. Then, using ultraviolet mutagenesis method, a mutant LHUM107 with outstanding urease-producing ability was further obtained to study its effects on calcite precipitation. The mutant LHUM107 had good genome stability and exhibited 92.2% urea-degrading efficiency till 21st generation. Response surface methodology (RSM) noted that the urea degradation was more dependent on initial urea addition, and brought forward the optimal conditions. Adapting to these optimal conditions, calcite precipitation by mutant LHUM107 and extracellular urease was respectively further investigated. It was shown that extracellular urease excreted from mutant LHUM107 was more effective and more targeted for CaCO₃ precipitation.

Key words: microbial calcite precipitation; urea-degrading; extracellular urease; *Bacillus*; 16S rRNA gene sequencing

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