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Biocement soil improvement using acidified all-in-one solution by acid buffer

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To date, soil bio-cementation via Microbially Induced Carbonate Precipitation (MICP) has been extensively studied as a promising alternative technique for ground improvement to address the growing environmental concerns of traditional chemical cementing agents. This paper presents a new one-phase injection method of biocementation using an acidified all-in-one biocementation solution (i.e., a mixture of bacterial culture, urea, and CaCl2). The key feature of this method is to generate a lag period of the MICP process, which can be controlled by adding acidic pH buffer to the biocementation solution, so that the formation of bio-flocs and CaCO3 crystals is significantly delayed. This feature allows the low-pH all-in-one biocementation solution to be fully injected into the sand column before the biocementation occurs, hence serious surface clogging can be avoided. The duration of the lag phase was evaluated using different amount of HCl or acidic buffer. The performance of biocementation using the acidified all-in-one solution was tested for short and long sand columns bio-stabilization, showing a significant improvement of uniformity. The results of this study show strong potential to scale up the proposed approach to filed applications.

References

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