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Synergistic Chemical and Microbial Cementation for Stabilization of Aggregates

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ABSTRACT

The use of Portland cement as a stabilizer of granular materials such as sand, is comparable to that in concrete. Although a relatively small percentage of cement is used for a stabilized soil system, the consumption of cement in Australian road bases and mining backfills is only second to the concrete industry. Conventionally, Portland cement is used as a binder for these applications. This paper explores low embodied energy alternative binders such as geopolymers and microbial cementation. A combination of the chemical and microbial binders has been attempted. The performance of the stabilized systems in terms of compressive strength, elastic modulus and water absorption was determined. It is noted that the chemical and the microbial cementation work synergistically. A microstructural investigation has been performed to reveal the synergistic nature of the two binding systems. The new technology is able to significantly reduce the embodied energy and emission of stabilized granular materials.

KEY WORDS

Road bases, Maintenance, Cement stabilisation, Geopolymer, Bacteria, Microbial calcite, Sustainability