Summary of publication No. (2)

Title: Impact of the immobilized *Bacillus cereus* MG708176 on the characteristics of the bio-based self-healing concrete

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Abstract

Novel carrier units were evaluated for their bio-healing benefits in our study to increase the efficacy of concrete healing. *Bacillus cereus* MG708176, an alkali-tolerant, calcite precipitating, endospore- forming strain was added as a bio-healing agent after its immobilization on wood ash units. A spore concentration of [1.3×10^7 spore/cm^3] combined with 2.5% w/w urea was added to cement. Beams of 40 × 40 × 160 mm were used and tested for completely damaged mortar specimens after 7, 14, and 28 days of water treatment. Using wood ash bacterial mortars, totally destructed specimens were fully healed in all time intervals. Positive changes in concrete mechanical properties in bacterial wood ash treatment that were 24.7, 18.9, and 28.6% force for compressive, flexural, and tensile strengths more than control. The micro-images of the Scanning Electron Microscope (SEM) showed the dense concrete structure via calcite, Bacillafilla, and ettringite formation. Our results have shown improvements in the concrete healing efficiency and the mechanical concrete properties by filling the concrete cracks using a calcite-producing bacterium that is immobilized on wood ash units.

Keywords:

wood ash bacterial carrier, bacterial concrete, bio-healing of cracks