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Effect of self-healing on fatigue of engineered cementitious composites (ECCs)

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Abstract

This paper presents a pioneer study on the effects of self-healing on the flexural fatigue performance of engineered cementitious composites (ECCs), a unique class of high-performance fiber-reinforced cementitious composites (HPFRCC) exhibiting tensile strain-hardening behavior with tensile strain capacity in excess of 3% with only 2% or less fiber content by volume. Results show that self-healing greatly extends the fatigue life of ECC because water/dry conditioning not only heals the matrix cracks but also recovers the fiber/matrix interfacial bonds which leads to increased fiber-bridging strength. ECC fatigue life increases with increasing fatigue pre-damage level because higher fatigue pre-loading cycles together with water/dry conditioning troubleshoots more potential failure planes. Repeated healing at lower pre-damage level is feasible and significantly extends fatigue life of ECC.

***Keywords**: Engineered cementitious composites (ECCs); fatigue; fiber-bridging; fiber/matrix interface; self-healing*

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