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(57) Abstract :

The present invention discloses a self-healing concrete composition incorporating nano-encapsulated bacterial spores and nutrients capable of autonomously repairing microcracks through biomimetic mineralization. The bacterial spores, protected within nano-scale capsules made of silica or biodegradable polymers, remain dormant during mixing and activate upon exposure to moisture from crack formation. Once activated, the bacteria metabolize the embedded nutrients and precipitate calcium carbonate, effectively sealing the cracks and restoring structural integrity. This system enhances durability, reduces maintenance costs, and supports sustainable infrastructure development.

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