

# Successfully created 'living' concrete that can heal cracks by itself

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An international team of scientists has made a breakthrough in developing concrete that can heal itself like a wound on human skin. This is the research of Dr. Congrui Grace Jin, which introduces self-healing concrete technology thanks to microorganisms, promising to revolutionize the construction industry worldwide.

Concrete, a common material used in everything from homes to bridges, often develops cracks over time. Even small cracks allow water and air to seep in, compromising the steel reinforcement inside. Repairs are not only costly but also potentially risky, especially for important infrastructure projects.

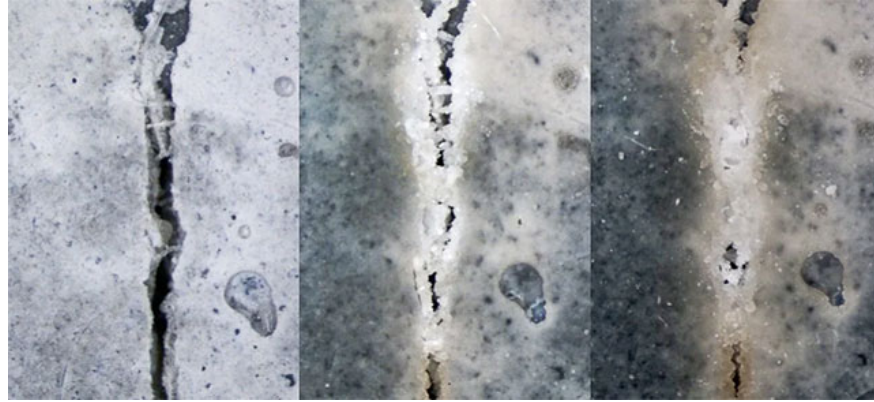
Over the past three decades, many studies have tested bacteria to 'automate' the process of repairing cracks in concrete. "But all existing methods are not truly autonomous because they require external nutrients," Dr. Jin emphasized.

The team took inspiration from lichens — symbiotic organisms between fungi and blue-green algae that can survive on just air, light, and water. They created a synthetic version that combines diazotrophic blue-green algae (which absorb CO<sub>2</sub> and nitrogen from the air) with filamentous fungi (which collect calcium ions to form CaCO<sub>3</sub> minerals to fill cracks).

The three pairs of microorganisms tested were:

1. *Trichoderma reesei* + *Anabaena inaequalis*
2. *T. reesei* + *Nostoc punctiforme*
3. *T. reesei* co-cultured with both algae species

Experimental results showed that the microbial pairs thrived in an environment with only air and light, without the need for additional nutrients. More importantly, they created CaCO<sub>3</sub> right in the actual concrete sample.



The breakthrough of this technology lies in its ability to operate completely autonomously, without human intervention. In the future, this could significantly reduce the cost of inspection and maintenance of the building.

Dr. Jin is collaborating with social scientists at Texas A&M University (USA) to evaluate the practical applications of "living" materials, while addressing the ethical and legal issues that arise. The research, funded by DARPA's Young Faculty Award program, marks an exciting combination of biology and engineering to solve global problems in the construction field.

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