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February 2026

CHAPTER NEWS

Progress through Knowledge

Concrete In the Steel City

2026 Pittsburgh Area Chapter Upcoming Meetings & Events

STUDENT EVENT MEETING
Wednesday - March 4th
DOMENICO'S RESTAURANT
Piazza Plaza, 20550 Route 19
Cranberry Twp., PA 16066

AWARDS BANQUET
Friday - April 24, 2026
PITTSBURGH ZOO AQUARIUM
Pittsburgh, PA

GOLF OUTING
Monday - July 20, 2026
QUICKSILVER GOLF CLUB
Midway, PA 15060

For more upcoming events visit acipgh.org/calendar-of-events

PITTSBURGH AREA CHAPTER
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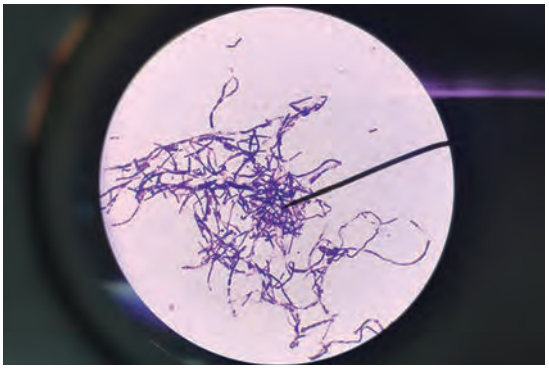
aci 2023 Excellent Chapter
February 2026
CHAPTER NEWS

Self-Healing Concrete Help Buildings Seal Themselves

By Ricardo Treviño | Courtesy of TecScience Biotechnology Posted on August 6, 2024

This mixture with a certain type of bacteria represents an innovative solution for the construction industry.



The bacterium Bacillus subtilis serves as an additive in the self-healing concrete; it captures CO2 and combines it with calcium ions to form carbonate, which seals the cracks. (Photo: Shutterstock)

The bacterium Bacillus subtilis serves as an additive in the self-healing concrete; it captures CO2 and combines it with calcium ions to form carbonate, which seals the cracks.

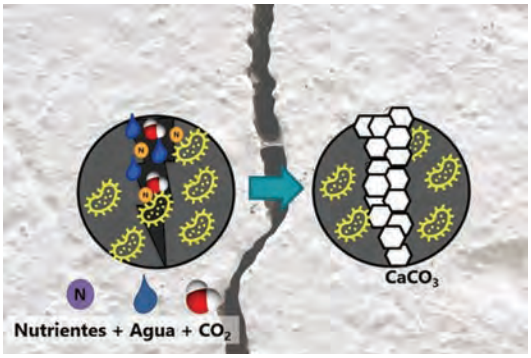
Researchers have developed a groundbreaking **self-healing concrete** capable of sealing small cracks. This advancement means that building walls could essentially "heal" themselves, similar to how our skin **regenerates after injuries and scrapes**.

This innovation is made possible by a bacterial additive that helps the concrete form **calcium carbonate**, a white powder commonly seen as limescale in showers and sinks. Calcium carbonate has been associated with self-healing properties observed in ancient construction materials, including structures nearly 2,000 years old, such as the Pantheon in Rome and the Roman Colosseum.

"This material has a **specific hardness and is chemically very stable**. It forms naturally from calcium alone, but bacteria accelerate the transformation into calcium carbonate," explains Alejandro Montesinos, head of the Decarbonization, Climate Change, and Circular Economy Research Group at Tec de Monterrey and a member of the Institute of Advanced Materials and Sustainable Manufacturing.

Researchers have tested this type of bacteria for the past few years, particularly Bacillus subtilis, which feeds on CO2 and possesses **biomineralization properties**. In other words, during its metabolic process, it produces calcium carbonate.

Among its various benefits, this material also aims to address the **CO2 emissions generated by the cement industry**. With approximately 2.3 billion tons of CO2 emissions annually, the industry is one of the significant contributors to global greenhouse gas emissions, accounting for nearly 7% of the total.



In the presence of moisture (water), the bacterium Bacillus subtilis feeds on nutrients such as calcium, magnesium, and CO2, and during its metabolic process, it produces calcium carbonate. (Photo: Courtesy of Alejandro Montesinos)

CO2 AND BACTERIA: THE FOUNDATION FOR SELF-HEALING CONCRETE

When calcium oxide is combined with CO2, it naturally forms calcium carbonate over time due to thermodynamic equilibrium, explains the researcher. This process can be **simplified and accelerated with the help of bacteria**.

"Stalactites are a prime example; bacteria aid in their formation. It's not just the water with its calcium and magnesium content, but also **the bacteria and the biochemical process** that promote their development," he notes.

Like similar organisms, Bacillus subtilis requires moisture and feeds on nutrients like calcium and magnesium to grow and reproduce. In its metabolism, it uses ions from these minerals, captures CO2, and combines them to form carbonates, eventually turning **into rock**.

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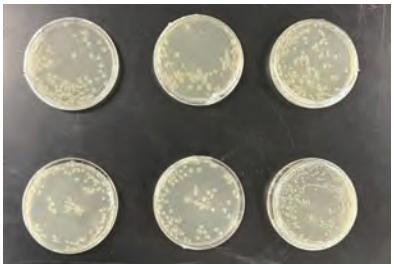
Self-Healing Concrete Help Buildings Seal Themselves

As it consumes calcium and CO2, the bacterium turns **carbonate in a biomineralization process** that the researcher compares to dinosaur fossils—essentially, the bacteria become rock and seal the cracks.



The bacteria accelerate the process of calcium carbonate formation, which helps seal cracks. (Photo: Courtesy of Alejandro Montesinos)

Additionally, as a mode of defense and survival, the bacteria go through a self-sacrificing phase where they die, but not before **reproducing and laying spores ready for the next generation** when conditions are right.

These characteristics make the bacteria valuable as an additive to give concrete, based on carbonates and various mineral bonds, **the ability to self-repair**. In buildings, this would function similarly to the **healing process in human skin**.

Since LWC is also highly porous, it is difficult to place the mixture correctly. Another issue with LWC is that the cement tends to separate from aggregates if mixed incorrectly.

TRAINING BACTERIA TO SURVIVE IN CONCRETE

First, it's crucial to ensure bacteria can survive in concrete to enable them to produce calcium **carbonate**. Concrete's high pH and alkalinity make it a harsh environment where most microorganisms cannot thrive.

This presents a major challenge for researchers who "train" the bacteria to withstand the pH conditions of concrete, even when it's mixed with water.

"If you just put any Bacillus subtilis strain in concrete, it's likely to die and fail to grow or reproduce. **The challenge is to get the bacteria to adapt** so that when we introduce it into the concrete, it won't perish," the researcher explains.

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Chapter News is published by the American Concrete Institute, Pittsburgh Area Chapter for the purpose of informing members and others about issues of concern to the concrete industry. If you have information to include in this publication or any comments, contact ACI Pittsburgh Chapter at 724-452-1468

A Warm Welcome & Thank You to Our Newest Chapter Members!

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The Pittsburgh Area Chapter continues to grow because of support from all of our members!

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Self-Healing Concrete Help Buildings Seal Themselves

To address this, **they mix bacterial spores into the concrete**, embedding them in a protective matrix. If the concrete develops a crack, the spores become exposed, germinate, and the bacteria grow again. With **adequate moisture, nutrients, and CO2**, the bacteria will carry out mineralization.

In controlled laboratory conditions, **self-repair can take 15 days to a month**, depending on the crack size. For instance, tests on cracks about one to two millimeters wide and 12 centimeters long took around 30 days to heal.

Researchers are halfway through this project. The next steps involve preparing the support system t**o transition from lab tests to real-world, concrete** testing in environments with varying humidity levels and CO2 presence.

The bacteria are prepared to withstand concrete's high pH and ensure their survival. (Photo: Courtesy of Alejandro Montesinos)

AIMING FOR A CONSTRUCTION INDUSTRY SOLUTION

Cracks in concrete are a common issue caused by factors like lack of moisture and temperature fluctuations, says Montesinos. He clarifies that the goal of the material being developed in the lab is to address small fissures. Its main application is more aesthetic, aimed at sealing minor cracks.

"It will help with self-repairing small cracks, but **it's not designed for larger fractures in concrete**. It's not suitable for load-bearing walls or structures that need to support weight and develop cracks for some reason," he explains.

The bacteria **can survive in both indoor and outdoor conditions**. However, it cannot withstand temperatures above 100°C, such as those encountered during a fire or direct flame exposure. While no tests have confirmed this, **the spores may remain dormant for years**.

"It's possible that in 100 years, it could still have this effect. The theory suggests that spores can lie dormant for years and reactivate once the matrix is exposed, perhaps by a scratch, and when moisture reaches it, the mineralization process could start," the researcher says.

Montesinos envisions self-healing concrete as a solution that **could be used as a final layer in construction**, akin to plaster and other finishes applied to buildings.

Additionally, he emphasizes that this research provides an alternative to greenhouse gas emissions and **promotes circular economy principles**.

He notes the importance of rethinking CO2—not as waste to be discarded into the environment but as a **valuable resource that can be repurposed for new applications**.

11th Annual Excellence in Concrete Project Award

If you wish to submit an entry to be considered for this award, please visit our website acipgh.org to download the application form.

Reminder:
The deadline for project entries is February 28, 2026.

LIFETIME ACHIEVEMENT AWARD - TRIBUTE TO: THOMAS "TINK" BRYAN

The Lifetime Achievement Award (formerly known as the Tink Bryan Award) was created in honor of an outstanding individual who had dedicated himself to his family, business, and the concrete industry. For several years now, the Chapter has honored various individuals with this award. The Pittsburgh Chapter Board of Directors is requesting nominations for this year's recipient. If a candidate is selected, they will be announced at the Awards Banquet in April. The candidate should demonstrate exceptional commitment and achievement of outstanding service to the concrete industry, and, throughout their professional career, has persistently made significant contributions in areas such as leadership, quality, or education in support of concrete promotion and industry advancement.

Please forward a letter with your candidate(s) name and reasons for nomination to:
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To be accepted for board review, nominations should be received by March 15, 2026.

Past Award Recipients:

2025 – Carol Tasillo
2024 – Brian Montarti
2022 – David Thomas
2016 – Chuck Niederriter
2014 – Mark Patton
2012 – Robert Lawrence
2008 – Russell Smith, Sr.
2007 – John Thrower, Sr.
2006 – Robert A. Prisby
2005 – David Chilcote, Sr.
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2003 – Joe Homitsky, Sr.
2002 – Paul Rader
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1999 – Wayne Miller