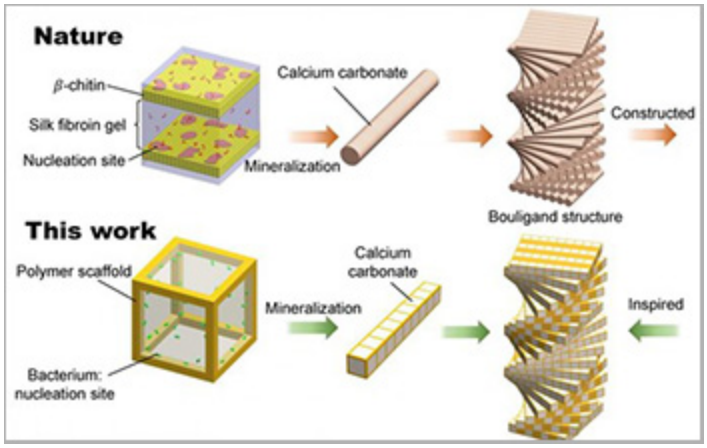
Research News

Can bacteria make better crack-resistant materials?

Researchers harness the power of living organisms to make new materials



Researchers are harnessing the power of living organisms to make new materials.

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Biological systems can harness living cells for growth and regeneration, but engineering systems cannot -- or couldn't until now.

Qiming Wang and other researchers at the University of Southern California (/cgi-bin/good-bye?https://viterbischool.usc.edu/news/2021/02/can-bacteria-make-stronger-armor-cars-and-airplanes/) Viterbi School of Engineering are harnessing living bacteria to create engineering materials that are strong and resilient. The U.S. National Science Foundation <https://www.nsf.gov/awardsearch/showAward?AWD_ID=1943598&HistoricalAwards=false> -funded research is published in *Advanced Materials* (/cgi-bin/good-bye?https://onlinelibrary.wiley.com/doi/10.1002/adma.202006946).

"The materials are living and self-growing," said Wang. "We have been amazed by the sophisticated microstructures of natural materials for centuries, especially after microscopes were invented to observe these tiny structures. Now we take an important step forward. We use living bacteria as a tool to directly grow structures that cannot be made on our own."

The researchers work with specific bacteria known for secreting an enzyme called urease. When urease is exposed to urea and calcium ions, it produces calcium carbonate, a strong mineral compound found in bones or teeth. "The key innovation in our research," said Wang, "is that we guide the bacteria to grow calcium

carbonate minerals to achieve microstructures similar to those in the natural mineralized composites."

Wang added that "bacteria know how to save time and energy. They have their own intelligence, and we can harness their smartness to design hybrid materials that are superior to fully synthetic options."

By combining living bacteria and synthetic materials, Wang said, this new living material demonstrates mechanical properties superior to that of any natural or synthetic material currently in use.

"The hybrid material these researchers have come up with harnesses guided biomineralization in a way that is novel and exciting," said Nakhiah Goulbourne, a program director in NSF's Directorate for Engineering. "This could have important implications for civil infrastructure and other structural materials."

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