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Restoration with the help of waste and urine of mammals: a new eco-material has appeared



To create biocement, scientists took two types of waste: industrial carbide sludge, which is a waste from production of gaseous acetylene, and urea contained in the urine of mammals.

First, the carbide sludge is treated with acid for soluble calcium. Urea is then added to it to form a cementing slurry. After that, the team adds a bacterial culture to the resulting mixture. Bacteria from the culture break down urea in solution and form carbonate ions.

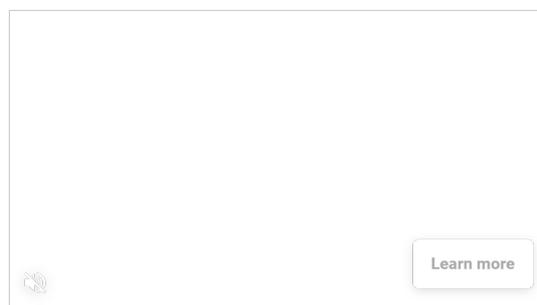
The resulting ions react with calcium ions in a process called microbially induced calcite precipitation (MICP). This reaction produces calcium carbonate, a hard material found in chalk, limestone, and marble.

"Biocement is sustainable and renewable alternative to traditional cement and has great potential for use in construction projects, says Professor Chu, one of the scientists. "Our research makes biocement even more sustainable by using two types of waste as raw materials. In the long run, this will not only reduce the cost of biocement production, but also reduce the cost of waste disposal."

The biocement production process requires less energy and generates less carbon emissions compared to traditional cement production methods.

"One part of the cement production process is the combustion of raw materials at very high temperatures, exceeding 1,000 ° C, with the formation of clinkers - a binder for cement. This process produces a lot of carbon dioxide, says Professor Chu. "However, our biocement is produced at room temperature without burning anything, and thus it is a greener, less energy-intensive and carbon-neutral process."

Another advantage of the NTU command method when composition of biocement is that both the bacterial culture and the cementing solution are colorless. When applied to soil, sand or stone, their original color is preserved.



This makes it useful for restoring old stone monuments and artifacts. So scientists used biocement to repair old Buddha monuments in China. Biocement can be used to seal crevices in cracked monuments, as well as to repair broken pieces such as the fingers of the Buddha's hands. Since the solution is colorless, the monuments retain their original color, keeping the restoration work true to history.

The team is currently testing working out in an East Coast park, using it to reinforce the sand on the beach. The experiment showed that as a result of spraying a solution of biocement on top of the sand, a hard crust is formed, which prevents the sand from being washed out into the sea.

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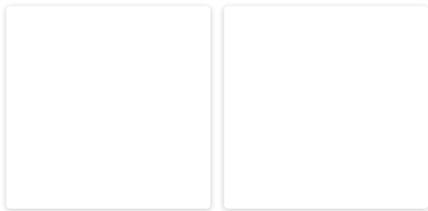
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