

Can "White Carbon" Save the Earth? Concrete of the Future Created Through Recycling

C⁴S* Research and Development Project

*C⁴S: Calcium Carbonate Circulation System for Construction

While the burning of fossil fuels is one major source of CO₂ emissions, another is the production of concrete. The raw material for cement used in making concrete is limestone. CO₂ is released during cement manufacturing when thermal energy is added to the calcium carbonate (CaCO₃) contained in limestone. Considering the amount of concrete in cities, it's easy to grasp the impact of these emissions. Our effort to help restore the global environment is based on the concept of resource circulation, where the CO₂ emitted by concrete is also recovered by concrete.



The Himalayas and the Alps: The Challenge for Concrete Is to Model Great Mountain Ranges

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During Earth's Cenozoic era, the uplift and weathering of the Himalayas and Alps fixed large amounts of CO₂ when calcium contained in the rock trapped carbon dioxide in the atmosphere as carbonate. What if we could reproduce the same process with concrete, a material containing that very same calcium? With this concept in mind, we worked on developing a new technology to produce concrete by combining CO₂ with used waste concrete. Our code name for it is "CCC!"

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>> CCC to the Rescue

Continuing to make concrete using limestone, the raw material in cement, poses a number of problems, including CO₂ emissions and depletion of resources. The solution requires a new material that doesn't use limestone or emit CO₂. Our answer is CCC, calcium carbonate concrete, which is made by combining crushed waste concrete and rock with calcium carbonate that has trapped atmospheric CO₂.

>> Add White Carbon to the Mix

CCC is made from waste concrete, CO₂, rock, and other resources that are abundant throughout the world. It's a recyclable material that reduces emissions as it is produced. Using CCC in 50 percent of future construction has the potential to fix approximately one billion tons of atmospheric CO₂



annually. As with green carbon fixed in terrestrial ecosystems and blue carbon fixed in marine ecosystems, this version is symbolized by color; in this case, white. It will likely make a major contribution toward environmental renewal.

KEYWORD

CCC
(Calcium Carbonate Concrete)

Calcium carbonate concrete is formed by fixing CO₂ in waste concrete. This sustainable new material fixes more CO₂ with less energy than conventional methods and simplifies recycling and use.

FUTURE VISION

2025

Set Expo 2025 as a Target

We will develop CCC that's as strong as standard concrete and construct a model building at Expo 2025 in Osaka, Kansai, Japan. With this exhibition, we will confirm that the amount of captured CO₂ exceeds the amount of CO₂ emitted.



2027

Collect Data on Small Mock-up Buildings

We will construct small (one- or two-story) mock-up buildings and collect data to prepare for real-world social implementation. Based on the data, we will confirm that the materials used for supporting columns and walls meet the requirements of Japan's Building Standards Act and can guarantee a specified service life.



2029

Complete Construction of First CCC Building

After construction of one CCC building and using collected data to show it conforms to Japan's Building Standards Act, we will obtain approval for the use of CCC in this project. The ultimate objective is to have the material approved for use anywhere and at any time and achieve real-world social implementation by 2050.

