

## Successful Development of Manufacturing System “CARBOCATCH™” to Fix CO<sub>2</sub> into Fresh Concrete

Taiheiyo Cement Corporation (Headquarters: Bunkyo-ku, Tokyo; President: Masafumi Fushihara) announces successful development of “CARBOCATCH™”, an efficient system to fix carbon dioxide (CO<sub>2</sub>) into fresh concrete.

“CARBOCATCH™” (Figure 1) is capable of fixing externally supplied CO<sub>2</sub> into cement slurry as solid, fine calcium carbonate at high efficiencies of more than 90% (more than 330 kg per ton of cement in the cement slurry) (Photo 1, Figure 2).

For CO<sub>2</sub> sequestration in concrete, it has been common to directly spray CO<sub>2</sub> gas or dry ice onto the concrete during the mixing process. We have established a new system that achieves the same purpose more efficiently.

CARBOCATCH<sup>\*1</sup> is our proprietary system that efficiently fixes CO<sub>2</sub> by circulating cement slurry, a mixture of cement and water, in a sealed container filled with CO<sub>2</sub>. By partially replacing the ordinary concrete materials with the reaction product in slurry form obtained from the CARBOCATCH system (hereinafter referred to as the CARBOCATCH slurry; Figure 3), CO<sub>2</sub> can be efficiently fixed into fresh concrete.

The CARBOCATCH has been established as part of carbon recycling (CCU<sup>\*2</sup>) technology development for sequestration of captured CO<sub>2</sub> into cement and concrete, based on findings from our Project of “Development of Carbon Circulation Technology for the Cement Industry (FY 2020-2021)” funded by the New Energy and Industrial Technology Development Organization (NEDO) of Japan.

Shown in Photo 2 is a wave-dissipating concrete block manufactured by using the CARBOCATCH slurry. The amount of CO<sub>2</sub> sequestered in the block is about 8.0 kg per m<sup>3</sup> of concrete, equivalent to 23 kg per ton of cement<sup>\*3</sup>, far exceeding the NEDO target of 10 kg per ton of cement. It has been also confirmed that the concrete made with the CARBOCATCH slurry is equal to or better than conventional concrete in terms of fresh properties, strength development, durability, suppression of bleeding and reduction of setting time.

Practical applications of the CARBOCATCH system are being studied. Production test on actual equipment was carried out for precast concrete products at Taiheiyo Precast Concrete Industry Co., Ltd. (Photo 3). Test construction was also conducted at our Kumagaya Plant to evaluate the applicability for pavement concrete (Photo 4). These tests revealed higher quality compared to conventional concrete, demonstrating that the system is an effective CCU technology that can be applied to general-purpose concrete production.

Under Carbon Neutral Strategy 2050, Taiheiyo Cement Group is working to achieve carbon neutrality in the entire supply chain by 2050, with special focus on developing various CCU technologies to capture CO<sub>2</sub> from cement kiln exhaust gas and utilize it as a new resource. Our efforts will continue toward the earliest commercialization of the CARBOCATCH system which will be one of the innovative technologies that contribute to the realization of full carbon neutrality.

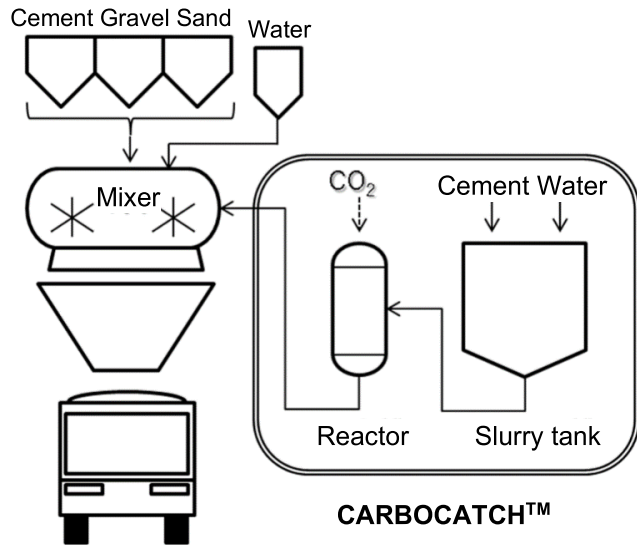


Figure 1. Conceptual diagram of CARBOCATCH

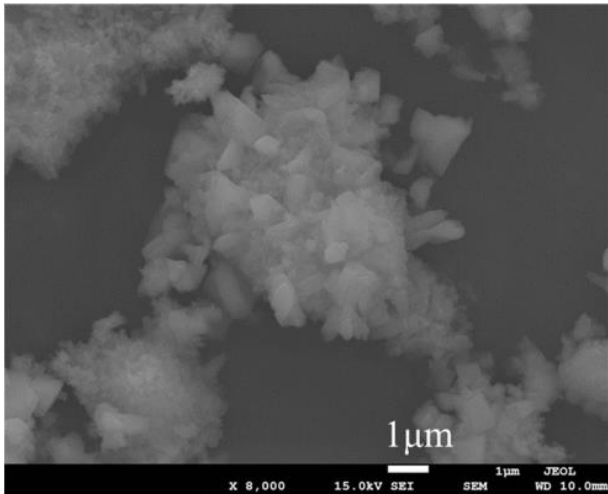


Photo 1. A secondary electron image of solids observed after reaction with CO<sub>2</sub> (fine crystals of calcite occurring around the cement particles)

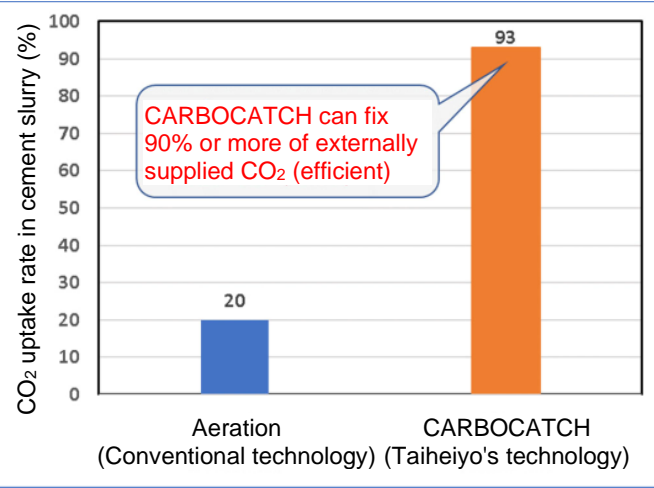


Figure 2. CO<sub>2</sub> uptake rate in CARBOCATCH slurry

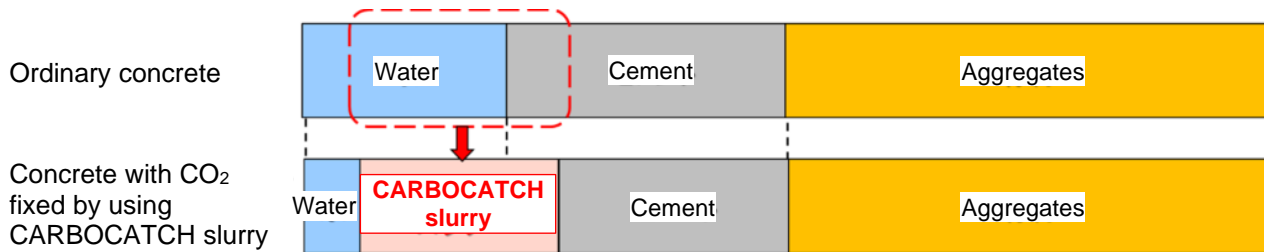


Figure 3. Concept of the concrete mix using CARBOCATCH slurry



Photo 2. Wave-dissipating concrete block manufactured by using CARBOCATCH slurry



Photo 3. Precast concrete products (continuous foundation blocks for guardrail) manufactured by using CARBOCATCH slurry



Photo 4. Test construction of pavement concrete using CARBOCATCH slurry

- \*1: CARBOCATCH is pending trademark registration by Taiheiyo Cement Corporation.
- \*2: CCU stands for Carbon dioxide Capture and Utilization.
- \*3: The intensity changes due to the use of cement in addition to the CARBOCATCH slurry during concrete manufacturing.