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Fundamental Study on CO_2 Fixation of Existing Concrete Structures

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Abstract *(approximately 200–300 words in One page)*
Decarbonization technologies are attracting attention as we move toward carbon neutrality by 2050. In the concrete technology field, Many technologies have been developed for fixing CO_2 in concrete in the manufacturing process. However, there are few technologies available to fix CO_2 in existing concrete. In this study, to confirm the extent to which existing concrete has the ability to fix CO_2, specimens taken from a concrete structure that was constructed 39 years ago were subjected to accelerated carbonation under conditions of a temperature of 20°C, humidity of 50%, and CO_2 concentration of 90%. Using these specimens, we measured the carbonation depth, the amount of CO_2 fixation, compressive strength, and performed XRD/Rietveld analysis.

As a result of the experiment, the carbonation depth increased in proportion to the square root of the carbonation period. The amount of CO_2 fixed increased with increasing carbonation period, and 12 kg/t of CO_2 was fixed in 28 days. We proved that the existing concrete which passed after the construction for several decades had ability to fix CO_2. And the compressive strength increased with increasing carbonation period. As for the reason, we thought that generated calcium carbonate filled inside voids of the concrete. The static modulus of elasticity decreased with increasing carbonation period. The predominant crystal form of calcium carbonate produced in the high CO_2 concentration was vaterite.