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Reservoir Rocks of CO2 Micro-Bubble Storage (CMS) and its Dissolution Characteristics

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Among many different portfolios in the CCS technology, CO2 micro-bubble storage (CMS) system that stores CO2 by injection in the gas phase and dissolution at shallower depths has been proposed. Basic concept of CMS is the replacement of underground water with CO2 dissolved water. CO2 is stored safely once it is dissolved and there is low leakage risk because of residual micro-bubbles having little buoyancy forces. CO2 dissolved in water is weakly acidic and can react with the minerals in the surrounding rocks. It is well-known that acidic solution is neutralized by rocks as it soaks into the ground, however the ability of neutralization is not completely estimated.

In this paper, in order to estimate the ability of rocks to neutralize CO2 micro-bubble dissolved water, two types of dissolution experiments of rocks were carried out using crashed and column specimens of sedimentary rock such as limestone, sandstone, and tuff. A batch type dissolution experiment in which rock samples were treated with the solution of CO2 dissolved in pure water using micro-bubble under CO2 partial pressure 0.0003 atm. And a flow-through type dissolution experiment was carried out using limestone samples for over 40 days in order to investigate the change of pore structure between before and after experiment. From these experimental results, the dissolution rate and the ability of neutralization of reservoir rocks were discussed.