Experimental Study on Sealing Mechanism of CO2 Hydrate during Carbon Dioxide Storage in Subseabed

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Implementation of CO2 geological storage in Japan requires securing new storage places in addition to aquifer. One promising storage place is subseabed. CO2 injected into the subseabed is expected to form a hydrate during the ascent process and to become a seal layer by clogging pores. This method will not require cap rock; thus expand the storage site and reduce storage costs. However, there is a concern about CO2 leakage due to a lack of sealing function of CO2 hydrate.

In this study, we investigate experimentally whether CO2 hydrate exhibits the sealing function as a cap rock by injecting liquid CO2 and forming CO2 hydrate in Toyoura sand enclosed in a core holder that reproduces subseabed pressure and temperature conditions. When liquid CO2 was injected at the same speed as buoyancy under the condition mimicking the 600 m water depth and the 150 m sediment depth below the seafloor, temperature increase indicating the formation of CO2 hydrate was observed about 36 hours after the start of injection. After confirming the formation of CO2 hydrate, liquid CO2 was injected again. We observed rapid pressure increase near the inlet of the core which means the pore clogging due to the CO2 hydrate formation.

Keywords: Storage in Subseabed, CO2 Hydrate, Sealing function

