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Geochemical monitoring of CO2 underground and an evaluation technique of geochemical features

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Mechanism of carbon dioxide (CO2) geological storage is similar to accumulation of oil and natural gas deep underground (gas trapping). Additionally CO2 dissolves into water in the reservoir (solubility trapping). A part of dissolved CO2 precipitates as carbonate minerals (mineral trapping). Geochemical trapping such as solubility and mineral trapping prevent upward migration of CO2 by eliminating its buoyancy. Amounts of solubility and mineral trapping strongly depend on storage sites. Timing of mineral trapping is still unclear. In this study, we present an evaluation technique of geochemical features at a CO2 geological storage site, the Nagaoka site for an example. We collected core and water samples from the injection well before CO2 injection. After cessation of CO2 injection, formation water was collected twice from the observation well by Cased-hole Dynamics Tester (CHDT, Schlumberger). Monitoring results showed that solubility trapping occurred around CO2 bearing layer and a condition of CaCO3 precipitation was prepared below the layer. Laboratory experiments indicated that Ca containing silicate such as plagioclase provide Ca to precipitate with dissolved CO2. A preliminarily result of reactive transport modeling showed solubility trapping was the dominant mechanism for CO2 trapping and mineral trapping increased with time at the Nagaoka site. Details of an evaluation technique of geochemical features will be presented at the session.