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An injection experiment with small amount of Carbon Dioxide

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The renewable energy that doesn't consume the fossil fuel, the energy conservation technique and so on are requested as a technology against the Global Warming. On the other hand, the energy production with the fossil fuel is inevitable for continued economic development. The practical application of the CCS technology is requested that extracts $CO_2$from the exhaustion gas of the fossil fuel and store it into the geological formation in order to reduce the discharge of CO_2into the atmosphere. The development of the CO_2geological storage technology in CCS is advanced at the geological units in AIST. The behaviour of the injected CO_2in the saline aquifer has been clarified in the AIST research works. The geochemical mechanism for $CO_2$to dissolve in formation water, to react with the rock, and to fix as a mineral is active soon after the injection (Okuyama et al., 20 08).
In AIST, the main subject of the research works has moved from the research of CO_2storage mechanism to that of the monitoring. At the CO_2monitoring, seismic monitoring is most often used. High resolution of the result is obtain and the strong seismic refraction and the low velocity change are expected at the boundary between the brine and the super-critical or gaseous $CO_2$when $CO_2$is stored widely. However $CO_2$is expanded widely and the width of the stored $CO_2$is small at the end. Moreover $CO_2$is expected to be dissolved. The dissolved and thin $CO_2$is hard to detect by the seismic refraction method. The resisivity is very sensitive for the dissolving CO_2. The breakthrough of the CO_2expand was detected by the resisivity logging of the monitoring well at the pilot plant in Nagaoka (Mito et al., 2009). Core sample experiment also suggested that the seismic velocity reduces during the injection of $CO_2$with the lower relative permeability but there is a small change at the relative permeability more than 20% (Nakatsuka et al., 2008).
The advantage of the seismic exploration and the domination of the resistivity survey are confirmed by the field experiment. To examine the analysis taking the advantages of the both exploration methods into account, a field experiment was carried out where gaseous $CO_2$was injected into a shallow aquifer by the shallow well and seismic and resisitivity survey lines were set across the well. The saline aquifer is located at the depth of 47.5m below the ground level and the casing pipe is set till the depth of 45m. The water table of the ground water is observed at the depth of 17m. Gaseous $CO_2$with the pressure of about 0.3MPa was injected with the constant flow rate in order to control the expansion of CO_2. In this presentation the summary of the experiment with the result of the well logging and surface CO_2flux survey.

Keywords: CCS, CO2, Geological Storage, Field experiment, Well logging, Surface survey