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An injection experiment with small amount of Carbon Dioxide(2)

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As energy production with the fossil fuel is inevitable for continued economic development, a 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_2 into the atmosphere. The development of the CO_2 geological storage technology in CCS is advanced at the geological units in AIST. The behaviour of the injected CO_2 in the saline aquifer has been clarified in the AIST research works as well as the development of the monitoring technology in the CO_2 geological storage.

At the CO_2 monitoring, 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 with certain measure of thickness. CO_2 is, however, expanded widely and the width of the stored CO_2 is small at the end of the storage layer. Moreover CO_2 is expected to be dissolved. The dissolved and thin CO_2 is hard to detect by the seismic refraction method. On the other hand the resistivity is very sensitive for the dissolving CO_2. Core sample experiments 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% (Lei and Xue, 2009).

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 using a shallow well in AIST (Tosha et al., 2010). The saline aquifer is located at the depth of 47.5m below the ground level. The resistivity was hard to measure due to various types of artificial deposits and the iron casing pipe set till the depth of 45m. A test well with a depth of 150m was drilled at the test field in Hokkaido. The polyvinyl chloride casing pipe was selected to make less influence to the resistivity measurements. The continuous temperature monitoring was carried out at the bottom of the injection well in AIST (Miyakoshi et al., 2010). The same monitoring tool was used. The temperature logging was also conducted before and after the CO_2 injection. This work was performed under the management of the Ministry of Economy, Trade and Industry (METI) as a part of the research and development on CO_2 geological sequestration project conducted by RITE.

Keywords: CO2, geological storage, grobal warming, monitoring, temperature logging