O219-P001 **Room: Poster Session Hall** **Time: May 27**

Monitoring of CO_2 migration by resistivity and SP survey -Experiment of CO_2 injection into rock samples-

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Geological storage of carbon dioxide (CO_2) is considered to be one of the most feasible methods to mitigate the greenhouse-gasses at atmosphere. A major challenge in geological storage of CO_2 is to monitor the migration of CO_2 in the reservoirs. Resistivity monitoring is thought to be one of the most feasible methods to map the migration of CO_2. Self potential (SP) method is also expected to monitor the migration of CO_2. To interpret the results of a field electrical survey, we need to evaluate the resistivity and SP changes during CO_2 injection into water-saturated porous medium quantitatively. In this study, we have carried out laboratory measurements of resistivity and SP during supercritical, liquid and gaseous CO_2 injection into water-saturated porous sandstone, respectively.

In this study, Berea sandstone (Devonian, Ohio, 50mm in diameter and 100mm in length, 17.9% porosity) was used. Disk mesh brass electrodes were attached to both sample ends and four ring brass electrodes were attached to the side of the sample at regular intervals. After the sample was saturated with pore water, which was made from KCl, NaCl and so on, CO_2 was injected from the bottom end of the sample at a constant pressure. During the CO_2 injection, when rectangular current was transmitted from both ends of the sample, resistivity and SP of each adjoining electrodes were recorded every 1 to 5 minutes. In this study, supercritical, liquid and gaseous CO_2 were injected into the sample, respectively. At a depth of below -800m, supercritical CO_2 phase is dominated, so we need to monitor supercritical CO_2 migration at the operation of CO_2 storage. We carried out CO_2 injection of each three phase to investigate the behavior of supercritical CO_2 migration.

As a result, according to the CO_2 injection, resistivity began to increase in all cases. Especially, in cases of supercritical and liquid CO_2 injection, resistivity increase moved from bottom to the top end of the sample. The changes of resistivity were 147% in the case of supercritical CO_2 injection, 131% of liquid CO_2 case and 15.7% of gaseous CO_2 case, respectively.

When CO_2 is injected into an aquifer, highly conductive formation water in pore spaces of the reservoir rock will be partially displaced by less conductive CO_2, so resistivity increase is expected. In this study, resistivity increase was identified in all cases, so this suggests that the migration of CO_2 can be detected by resistivity monitoring. The patterns of resistivity changes were different from each case. Density and viscosity of CO_2 are different at each phase, so there is a possibility that migration pattern is different from each phase. This difference can be mapped in this study.

In cases of the supercritical and gaseous CO_2 injection, SP and resistivity in some sections began to increase simultaneously. The changes of SP at that time ranged 0.03V to 0.16V. When CO_2 is injected into the sample, pore water flows and ions in the electrolyte are moved, so streaming potential appears and SP will change. In some cases, SP and resistivity changed simultaneously in all sections. This indicates that streaming potential occurs by the CO_2 injection and SP monitoring is also expected to monitor the migration of CO_2.