Measuring resistivity variations and estimating replacement ratios of rock samples injected with CO2

Kyosuke Onishi[1]; Yoshihiko Ishikawa[2]; Yasuhiro Yamada[3]; Toshifumi Matsuoka[4]

[1] Civil & Earth Res. Eng., Kyoto Univ.; [2] Civil and Earth Resources Engi,Kyoto Univ; [3] Civ. Earth Res. Eng., Kyoto Univ.; [4] Kyoto Univ

The CO2 sequestration in a deep aquifer is considered one of the most effective method to arrest Global warming. We must understand the behavior of injected CO2 to examine long-term stability of CO2 sequestration. We tried to monitor the behavior of supercritical CO2 injection in water-saturated sandstone by measuring the resistivity of core samples. The infiltration of CO2 into the core is expected to be detected sharply, because CO2 is an insulator while the pore water is a conductor. We made experimental apparatus that can reproduce the high pressure of the underground. A cylindrical sample of Berea sandstone(50mm in diameter and 120mm in length) was used in this study. It was coated with silicone, and current electrodes in both ends of the core. The end electrodes were a circular mesh made of copper. Point electrodes to measure potential were installed along the side of the core. CO2 as both gas, liquid, and supercritical phases was flushed through the sample. Consequentially, we could monitor the time-lapse behavior of CO2 in water-saturated sandstone. The results show that the replacement ratios calculated with the experimental results and Arche's equation are similar with the replacement ratio estimated from output volumes of CO2. This study indicates that the in-situ CO2 monitoring with electric exploration is an effective way to monitor CO2 behavior.