

Estimating CO₂ Saturation from Resistivity Change for Monitoring CO₂ Sequestration

Onishi, Kyosuke¹, Yoshihiko Ishikawa¹, Ziqiu Xue², Kazuhiko Tsukada¹, Yasuhiro Yamada¹, Toshifumi Matsuoka¹ (1) Kyoto University, Kyoto, Japan (2) Research Institute of Innovative technology for the Earth, Kyoto, Japan

The technique sequestering CO₂ into the ground is a high degree of expectation for reducing CO₂ emission. The realization of the CO₂ sequestration into the coal seam or aquifer must require the confirmation of the stability in long term after the sequestration of CO₂. It is considered that measuring electric resistivity is useful to monitor CO₂ migration. Because CO₂ is electrically bad conductor, the bulk resistivity of rock will increase when formation water is displaced to CO₂ in pores.

This report shows the result of the examination of CO₂ injection into rock cores in a pressure vessel, which create the same pressure and temperature in deep ground. We measured the change of electric resistivity of rock samples through the injection of CO₂, which is composed of gas, liquid or super critical phase. The results indicate the increasing of electric resistivity with CO₂ injection. Therefore, the method of electric exploration can observe the CO₂ distribution in the ground. Also, we can calculate the replacement ratio using Archie's equation and the ratio is quite equivalent to the volume of input and output of the experimental system. The estimation from the electric resistivity is considered to have a high reliability.

A CO₂ sequestration project was undertaken near Nagaoka in Japan and time-series well loggings were carried out in observation wells. We discuss the time-series CO₂ saturation from resistivity change of logging data in the observation wells using Archie's equation in consideration of the results of the laboratory examination.