Experimental Investigation of Carbon Dioxide Trapping due to Capillary Retention in Saline Aquifers

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Abstract.-
Sequestration of CO2 in deep saline aquifers has been considered one of the most promising alternatives to minimize CO2 emissions to the atmosphere. It can be achieved by several trapping mechanisms which are generally categorized as structural, dissolution, mineral and capillary trapping. Capillary trapping is a physical mechanism by which CO2 is permanently immobilized in the pore scale of aquifer rocks. It is an important, yet poorly understood trapping mechanism, primarily because of the lack of well characterized, laboratory or field data. The objectives of this study are to quantify capillary trapping of CO2, to examine the impact of imbibition flow rate and rock type on residual CO2 saturation, and to represent precipitation in the CO2 injection project. Coreflood experiments that mimic CO2 sequestration conditions in deep saline aquifers are performed with different imbibition flow rates on Berea sandstone. X-ray computed tomography (CT) scanner is employed to monitor fluid displacement, providing visualization of CO2 allocation and movement, and salt precipitation. Findings of this research are expected to provide better understanding of the physical mechanism associated with capillary retention of CO2 in geological media and to minimize the uncertainties in the CO2 sequestration project.