CHANGES IN PORE-MATRIX INTERFACE AND FLOW MECHANISM AFTER CO2 INJECTION

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Abstract

Implementation of enhanced oil recovery and especially CO_2 sequestration require a fundamental understanding of how injected CO_2 moves within and reacts with seal rocks and associated reservoirs. This understanding leads, in turn, to our ability to assess seal integrity and reservoir capacity.

Thus, this study will focus on quantifying reactivity and its rate in terms of various rocks and minerals therein as a function of pressure, temperature and CO_2-enriched brine composition, and how the pore/fracture network evolves as a function of space and time. The ultimate goal is to understand how representative seal rocks respond to CO_2-brine interaction that may lead to degradation of the seal integrity. We have selected the Opalinus (France) and the Duperow (Montana) formations as representative seals.

The methodologies that will be used include advanced electron microscopy, two-dimensional textural and mineral mapping, and three-dimensional micro x-ray computed tomography to determine mineral-pore relationships and how these change during experimental interaction with CO_2-brine. Further we will assess the diffusion processes of water and carbon-species via nuclear magnetic resonance.

This study addresses one of the major concerns about the sequestration technology, and that is how secure the CO_2 will store and prevented from leaking through the seal rock. This research will quantify the changes in pore features, and communication of reactive fluids from the fracture environment into the adjoining pore matrix. The expected outcome will be data that we can use in reactive-transport models to predict how these parameters may evolve over the lifetime of a sequestration site.

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