Reactive fluid flow in CO2 storage reservoirs – Pore network model study

GCCC Digital Publication Series #14-03

Seunghee Kim
J. C. Santamarina

Keywords:
Modeling-Flow simulation; Rock-water-CO2 reaction

Cited as:
Kim, S. and Santamarina, J.C., 2014, Reactive fluid flow in CO2 storage reservoirs – Pore network model study: manuscript in preparation. GCCC Digital Publication #14-03.

Abstract:

Water acidifies in the presence of CO_2 and prompts mineral dissolution. Pore network modeling is used to investigate reactive fluid flow in CO_2 storage reservoirs during injection when advective transport prevails. Mineral dissolution satisfies kinetic rate laws and continues until thermodynamic equilibrium is reached. In advection-dominant regimes, network simulation results show that species concentration, tube enlargement and flow rate can be summarized in terms of the dimensionless Damköhler number *Da* which is the ratio between advection time along a pore and the reaction time. Reservoirs will tend to experience localized enlargement near injection wells (before water drying) and compact dissolution in the far-field. The Damköhler number couples with initial pore-size variability to distort the relationship between mean tube diameter and either local or network-average flow rates. Both the Damköhler number and pore-size variability should be considered in field-scale numerical simulators.

To access full text, please contact the author or visit:

Manuscript in preparation.