Numerical simulation of impacts of mineralogical compositions on trapping mechanisms and efficiency of carbon dioxide injected into deep saline formations

JUNG-HWI KIHM & JUN-MO KIM
School of Earth and Environmental Sciences, Seoul National University, Seoul 151-742, Republic of Korea
junnokim@snu.ac.kr

Abstract A series of numerical simulations using a multiphase thermo-hydro-chemical (THC) numerical model is performed to analyse groundwater and carbon dioxide flow and hydrochemical reactive transport due to geological storage of carbon dioxide in a deep saline sandstone aquifer and to evaluate impacts of its mineralogical composition on trapping mechanisms and the efficiency of injected carbon dioxide. The results show that the mineralogy of the sandstone aquifer has significant impacts on the hydro-chemical behaviour of injected carbon dioxide and thus its trapping mechanisms and efficiency. The mineral trapping of injected carbon dioxide takes places as precipitation of carbonate minerals such as calcite, ankerite, dawsonite, siderite and magnesite. Ankerite contributes most to the mineral trapping of injected carbon dioxide. As a result, the precipitation amount of secondary carbonate minerals and the efficiency of mineral trapping increase significantly as the volume fraction of chlorite in the sandstone aquifer increases.

Key words carbon dioxide; geological storage; saline formation; mineralogical compositions; hydrodynamic trapping; solubility trapping; mineral trapping