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Reactive Solute Transport in Heterogeneous Porous Media

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CO2 geological storage in saline aquifer is significantly influenced by the reactive solute transport in the fracture media. However, the governing factors and coupling mechanisms of solute transport within the fracture at different periods under seepage-chemical coupling remain unknown. In this investigation, reactive solute transport experiment on sandstone fracture was conducted to determine the main mineral reactions. The fracture reactive solute transport analysis model taking mineral precipitation into account is proposed, and the fracture reactive solute transport characteristics under varying Pe number and Da number conditions are analyzed. The results of the dimensionless parameter analysis revealed that the Pe number was the governing factor of the solute transport process in the short period between injection and peak concentration of CO2, and that the time to peak solute concentration decreased with increasing Pe number. Under long periods of injection conditions, the solute transport process is governed by the Da number. Mineral precipitation at a high Da number obstructs the fracture, resulting in a progressive decrease in the variation rate of Ca2+ concentration during the late stage and the bypassing flow phenomenon of flow lines and species transport pathways.

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