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Reactive Transport Modeling of Dissolution/Precipitation in Fractured Porous Media

Tuesday, 31 May 2022 15:05 (15 minutes)

During CO_2 injection into geological reservoirs, CO_2 may flow through faults and fractures present in the seals. CO2 dissolution can acidify the formation water and drive a range of mineral reactions; For instance, the CO_2-acidified water can cause silicate mineral dissolution, which releases ions to solution. These ions can later react and form secondary minerals such as carbonates. These reactions may either increase the porosity (mineral dissolution) or decrease it (mineral precipitation). The reactions creating porosity may increase the permeability of the fracture networks in the seals and also reduce the capillary entry pressure, which can lead to the CO_2 leakage. On the other hand, formation of new minerals may decrease the permeability of the fracture systems and increase the caprock integrity. To predict how the dissolution and precipitation reactions affect the permeability of the fracture network in the fractured caprocks, we develop a model that can simulate the reactive transport processes in fractured networks. The reactive transport model is based on the Discrete fracture and matrix (DFM) model and is implemented in the MATLAB Reservoir Simulation Toolbox (MRST). Since in the fractured media the fluid transport rates are usually high, most of the mineral reactions considered in the model are treated as kinetic reactions. The developed model is then used to simulate the reactions between CO_2-acidified brine and minerals in different fracture networks (including a fracture network from Svalbard).

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References

Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

Online

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