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Contribution ID: **279**

Type: **Poster (+) Presentation**

A new pore-merging method for simulating mineral dissolution in porous media using pore-network models

Tuesday, 1 June 2021 20:00 (1 hour)

This study proposes and demonstrates a new pore-network modeling approach to simulate single-phase reactive transport and mineral dissolution in porous media. A new algorithm for the merging of pores and throats resulting from solid dissolution is introduced to guarantee the conservation of the main variables of interest during the merging process. Pore surface areas and throat conductances are modeled accurately using a novel application of correction factors and effective properties. Hence, the main objective of this presentation is to discuss this novel merging methodology and some applications in regular and random pore-network models. Our approach solves a coupled transport and reaction pore-network model that implements a kinetic model with a single heterogeneous chemical reaction describing the dissolution of calcite by acidic solutions. The reactive transport problem is described by the acid advection-diffusion transient equation in control volumes represented by pores and throats. The network geometry is updated based on the dissolution process happening at the mineral surface. Pores and throats are enlarged due to mineral consumption. The merging method is performed when two connected pores reach each other. Pore spaces are relocated in the network and correction factors are updated to conserve the effective surface areas and effective conductance of throats. The fluid flow field is also updated due to these new larger sizes of pores and throats. A wide range of pore-network models are used to study the reactive transport problem. The main results include the exploration of different dissolution regimes through porosity-permeability evolution curves, acid concentration profiles, and the use of statistical criteria to differentiate regimes. Importantly, this methodology has the ability to simulate permeability increases larger than 100-fold during the formation of preferential pathways through the network. The innovative approaches presented may be used to improve the representation of many subsurface applications where reactive transport and mineral dissolution are the fundamental phenomena at the pore-scale, including performance of acidizing for stimulation, geological storage of carbon dioxide (CO_2), and enhanced oil recovery.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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