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Dissolution-precipitation processes: patterns and product separation

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We consider a porous medium infiltrated by a reactive fluid that triggers coupled dissolution/precipitation reactions at pore surfaces. To study these processes, we model the porous medium as a system of interconnected pipes (Budek, 2012) with the diameter of each segment increasing in proportion to the local reactant consumption. With this model, we investigate different growth regimes in an evolving porous medium, allowing for both erosion and precipitation of the dissolved material. We incorporate nucleation events and consider different models of reactive area evolution, including passivation processes on mineral surfaces. We benchmark the model against the experimental results of Poonoosamy et al. (2020) and then consider the problem of separation of secondary reaction phases between small and large pores in the medium (Osselin, 2022), elucidating the underlying physical mechanisms.

Participation

In-Person

References

Budek, A., et al. (2012), Network models of dissolution of porous media. *Phys. Rev. E*, 86, 056318.
Poonoosamy, J., et al. (2020), Effects of solution supersaturation on barite precipitation in porous media and consequences on permeability: Experiments and modelling. *Geochim. Cosmochim. Acta.*, 270: 43-60.
Osselin, F., et al. (2022), Reactive transport experiments of coupled carbonation and serpentinization in a natural serpentinite. Implication for hydrogen production and carbon geological storage. *Geochim. Cosmochim. Acta.*, 318: 165-189.

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