

Experiment of Dissolution in Radial Geometries in Porous Media and Fractures

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ABSTRACT

Dissolution is very important for the rock deformation. Reaction-infiltration instability refers to the morphological instability of a reactive fluid front flowing in a soluble porous medium. The medium is chemically dissolved in the fluid at an overall rate depending on the local permeability and the rate of flow. Locally, an increase in permeability augments the flow and thus the rate of dissolution. In that way a positive feedback loop is established between dissolution and permeability increase. This process is important for many natural occurring phenomena, such as the weathering and diagenesis of earth rock, dissolution in salt deposits and melts extraction from the mantle etc.

My project is focused on experiment of dissolution in Radial Geometries in Porous Media and Fractures. In the experiment, we inject pure water into plaster sample in the Hele-Shaw Cell, taking advantage of the property of plaster slightly soluble in pure water[1][2]; we are able to see the dissolution patterns evolve with time. Here we firstly present the phase diagram of dissolution patterns with influence of Péclet and Damköhler number and the dynamic process of dissolution in 2D radial geometries in porous media and fractures. Péclet number $Pe = q/D$ where q is injection rate and D is diffusion constant and Damköhler number $Da = kh/q$ where k is reaction rate constant and h is characteristic length of system.

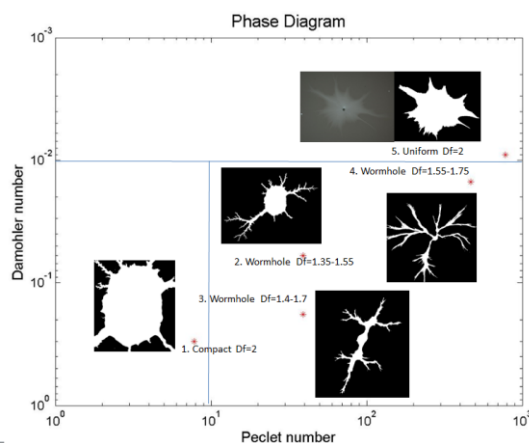


Fig. 1 Preliminary results for the phase diagram of dissolution patterns with influence of Péclet and Damköhler number.

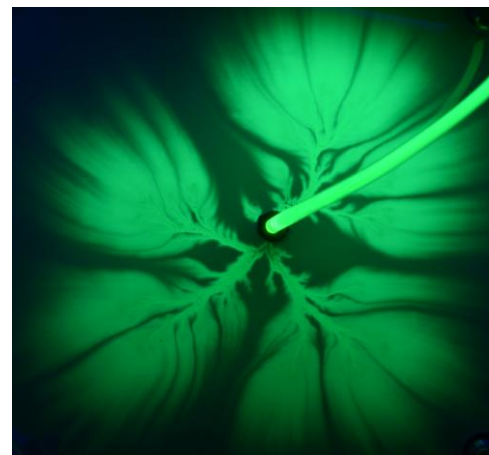


Fig. 2 Flow transport in dissolution pattern and porous media with fluorescence trace

References

1. Gerard Daccord. Chemical dissolution of a porous medium by a reactive fluid. Physical review letters, 58(5):479, 1987.
2. Gerard Daccord and Roland Lenormand. Fractal patterns from chemical dissolution. Nature, 325(6099):41-43, 1987.