Contribution ID: **82** Type: **Oral Presentation**

Direct prediction of fluid-fluid displacement efficiency in ordered porous media using the pore structure

Thursday, 2 June 2022 13:30 (15 minutes)

Fluid-fluid displacement in porous media is common in many natural and engineering settings. Extensive studies investigated the transition of displacement patterns, but the direct prediction of the displacement efficiency using the pore structure is lacking. Here, we propose a method to directly predict the displacement efficiency with no need of solving the Navier-Stokes and the Hagen-Poiseuille equations in ordered porous media. The predictive method origins from the pore-scale filling events, which can be divided into two directions such as the bulk flow direction and the transverse direction. For the bulk flow direction, the pore-filling event (burst) dominates the fluid invasion, and the invading phase forms a thin fingering channel. For the transverse direction, we introduce three invasion modes (compact, taper, and widen) to quantify fluid invasion. We can predict the finger width in each column, and the displacement efficiency can be predicted through the weighted average of the predicted finger width. We evaluate the predictive method using microfluidic experiments and pore-network simulations, confirming that the predictive method can reasonably predict the displacement efficiency in ordered porous media. The predictive method can directly predict fluid invasion according to pore structure, thus greatly improving the computational efficiency and is of significance in multiphase flow control.

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Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

Online

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