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Viscous coupling effect on hydraulic conductance in dynamic pore network model

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Viscous coupling during simultaneous flow of different fluid phases has a significant impact on their flow through porous media. In this work, a new multiscale strategy is proposed for multiphase flow in porous media. We use the interfacial continuum equation to simulate two-phase flow at pore scale and obtain empirical terms for the viscous coupling inside individual pores under variaous wettability conditions, interfacial distributions, and viscousty ratios. The hydraulic conductance of different fluid phases is validated by comparison with the mobilities computed using the lattice Boltzmann modeling. The mean value of relative error in hydraulic conductance predicted from our empirical model is less than 1%, compared to the other viscous coupling equations with errors more than 11%. The empirical coupling terms are then used in a dynamic pore-network model to efficiently simulate two-phase flow through porous media at core scale. It is shown that including viscous coupling leads to better predictions of relative permeability.

Participation

In-Person

References

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Energy Transition Focused Abstracts

Primary author: GONG, Wenbo

Co-authors: LIU, Yang; Prof. YANG, Ju (China University of Mining and Technology, Beijing); Prof. MORAN, Wang (Tsinghua University)

Presenter: GONG, Wenbo

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