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Representation of Fully Three-Dimensional Interfacial Curvature in Pore-Network Models

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Quasi two-dimensional approximations of interfacial curvature, present in current network models of multiphase flow in porous media, are extended to three dimensions. The effect of each principal radii of curvature on displacement is analysed using high resolution direct numerical simulations on synthetic geometries, for both uniform and mixed-wet wetting states, and the analysis is used to calibrate network model extensions. A fully three-dimensional consideration of interfacial curvature is shown to be a key step in improving the physical accuracy of network models. Finally, the calibrated network model is used to obtain predictions of relative permeability and capillary pressure for a water-wet and a mixed-wet Bentheimer sandstone, and compared to experimental measurements, where the inclusion of three-dimensional interfacial curvature yields more accurate predictions.

Participation

In-Person

References

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