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Image-based modeling of spontaneous imbibition in porous media

Monday, 31 May 2021 11:25 (15 minutes)

The dynamic pore-network modeling [1-3], as an efficient pore-scale tool, has been used to understand imbibition in porous media, which plays an important role in many subsurface applications. In this talk, we will present a dynamic pore-network model for imaged-based modeling of spontaneous imbibition in porous media. The μCT scanning of a porous medium of sintered glass beads is selected as our study domain. We extract its pore network by using an open-source software of PoreSpy, and further project the extracted information of individual watersheds into multiform idealized pore elements. A number of case studies of primary spontaneous imbibition have been conducted by using both the pore-network model and a VOF model, under different wettability values and viscosity ratios. We compare those model predictions in terms of imbibition rates and temporal saturation profiles along the flow direction. We show that our pore-network model can well predict imbibition rates and temporal saturation profiles under different viscosity ratios and wetting conditions, in comparison to the VOF model. We explore the effect of viscosity ratio on the entrapment of nonwetting phase. Moreover, we discuss the difference between spontaneous imbibition and quasi-static imbibition in terms of pore-filling mechanisms.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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3. Qin, C., Guo, B., Celia, M., Wu, R., 2019. Dynamic pore-network modeling of air-water flow through thin porous layers. Chem. Eng. Sci. 202, 194–207. https://doi.org/10.1016/j.ces.2019.03.038.

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