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Modeling of spontaneous imbibition in porous media from modified Lucas-Washburn equation

Monday, 30 May 2022 14:55 (15 minutes)

Capillary-driven flow in porous media is prevalent in nature and in industry, such as petroleum and hydraulic engineering as well as material and life sciences. Due to the numerous types and complex structures of porous media, together with a number of influencing factors, the study of capillary-driven flow based on theoretical analysis and numerical simulation methods is now widely carried out to reveal the flow mechanisms and seepage laws behind them. Recent advances made over the last several decades in this field are systematically reviewed in this work. The progress in mathematical models that modify and extend the Lucas-Washburn (LW) equation for various microchannels and porous media, including heterogeneous porous media, discrete fractures and capillary tubes with different geometries, is comprehensively summarized. In addition, numerical simulation methods used for capillary-driven flow in porous systems, such as molecular dynamics method, pore network modeling, the phase-field method and the volume-of-fluid method, are thoroughly reviewed. Based on these, the comments on the future works and research directions on the capillary-driven flow in porous systems are made. The present work provides a systematic and detailed review of advances in capillary imbibition in numerous fields, which is useful for understanding the capillary imbibition in different types of porous systems.

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References

Time Block Preference

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

Participation

Online

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