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Simulating immiscible multi-phase flow and wetting with 3D stochastic rotation dynamics (SRD) THOMAS HILLER, MARTA SANCHEZ DE LA LAMA, STEPHAN HERMINGHAUS, Max Planck Institute for Dynamics and Self-Organization, MARTIN BRINKMANN, Saarland University, Germany —
We use a variant of the mesoscopic particle method stochastic rotation dynamics (SRD) to simulate immiscible multi-phase flow on the pore and sub-pore scale in three dimensions. As an extension to the multi-color SRD method, first proposed by Inoue et.al., we present an implementation that accounts for complex wettability on heterogeneous surfaces. In order to demonstrate the versatility of this algorithm, we consider immiscible two-phase flow through a model porous medium (disordered packing of spherical beads) where the substrate exhibits different spatial wetting patterns. We show that these patterns have a significant effect on the interface dynamics. Furthermore, the implementation of angular momentum conservation into the SRD algorithm allows us to extent the applicability of SRD also to micro-fluidic systems. It is now possible to study e.g. the internal flow behaviour of a droplet depending on the driving velocity of the surrounding bulk fluid or the splitting of droplets by an obstacle.

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