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Pore-scale modeling of phase change in porous media RUBEN JUANES, MIT, LUIS CUETO-FELGUEROSO, Universidad Politecnica de Madrid, Spain, XIAOJING FU, MIT — One of the main open challenges in pore-scale modeling is the direct simulation of flows involving multicomponent mixtures with complex phase behavior. Reservoir fluid mixtures are often described through cubic equations of state, which makes diffuse interface, or phase field theories, particularly appealing as a modeling framework. What is still unclear is whether equation-of-state-driven diffuse-interface models can adequately describe processes where surface tension and wetting phenomena play an important role. Here we present a diffuse interface model of single-component, two-phase flow (a van der Waals fluid) in a porous medium under different wetting conditions. We propose a simplified Darcy-Korteweg model that is appropriate to describe flow in a Hele-Shaw cell or a micromodel, with a gap-averaged velocity. We study the ability of the diffuse-interface model to capture capillary pressure and the dynamics of vaporization/condensation fronts, and show that the model reproduces pressure fluctuations that emerge from abrupt interface displacements (Haines jumps) and from the break-up of wetting films.

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