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Multiphase flows in confinement with complex geometries BENJAMIN AYMARD, Complex Multiscale Systems Group, Department of Chemical Engineering, Imperial College London, MARC PRADAS, Department of Mathematics and Statistics, Open University, Milton Keynes, URBAIN VAES, Department of Mathematics, Imperial College London, SERAFIM KALLIADASIS, Complex Multiscale Systems Group, Department of Chemical Engineering, Imperial College London — Understanding the dynamics of immiscible fluids in confinement is crucial in numerous applications such as oil recovery, fuel cells and the rapidly growing field of microfluidics. Complexities such as microstructures, chemical-topographical heterogeneities or porous membranes, can often induce non-trivial effects such as critical phenomena and phase transitions . The dynamics of confined multiphase flows may be efficiently described using diffuse-interface theory, leading to the Cahn-Hilliard-Navier-Stokes(CHNS) equations with Cahn wetting boundary conditions. Here we outline an efficient numerical method to solve the CHNS equations using advanced geometry-capturing mesh techniques both in two and three dimensional scenarios. The methodology is applied to two different systems: a droplet on a spatially chemical-topographical heterogeneous substrateand a microfluidic separator.

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