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A diffused-interface approach for simulating compressible multiphase flows within an adaptive mesh refinement framework KARTHIK KANNAN, Arizona State University, FABIAN FRITZ, NICO FLEISCHMANN, Technical University of Munich, CARLOS BALLESTEROS, MARCUS HERRMANN, Arizona State University — A diffused-interface method for solving the compressible, multicomponent Navier-Stokes equations, i.e. the quasi-conservative five-equation model (Allaire et al., 2002) including capillary and viscous effects (Coralic and Colonius, 2014, Garrick et al., 2017) is used in conjunction with a novel, unstructured, cell-based adaptive mesh refinement (AMR) library (Ballesteros, 2019). Low dissipation, high spatial resolution is obtained by using a WENO-Z (Borges et al., 2008) discretization, while the numerical smearing of the material interface is controlled using a THINC scheme (Shyue and Xiao, 2014). This ensures higher-order while limiting the material interface width to 2-3 mesh cells. Surface tension effects are incorporated by means of a modified HLLC solver (Garrick et al., 2017). Curvature is computed using a stretched variant of the standard height function method (Cummins et al., 2005) to account for the smearing of the material interface. The use of AMR helps achieve higher mesh resolution in regions of liquid and shock discontinuities, which is crucial to compressible atomization applications. Results for test cases ranging from shock-interface interaction to liquid atomization are presented.

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