Abstract Submitted
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A Stabilized Finite Element Method for Compressible Phase Change Problems[1] YU ZHANG, FAN YANG, ANIRBAN CHANDRA, EHSAN SHAMS, MARK SHEPHARD, ONKAR SAHNI, ASSAD OBERAI, Rensselaer Polytechnic Institute — The numerical modeling of multi-phase interfacial phase change phenomena, such as evaporation of a liquid or combustion of a solid, is essential for several important applications. A mathematically consistent and robust computational approach to address challenges such as large density ratio across phases, discontinuous fields at the interface, rapidly evolving geometries, and compressible phases, is presented in this work. We use the stabilized finite element methods on unstructured grids for solving the compressible Navier-Stokes equations. The rate of phase change rate is predicted from thermodynamic variables on both sides of the interface. We enforce the continuity of temperature and velocity in the tangential direction by using a penalty approach, while appropriate jump conditions derived from conservation laws across the interface are handled by using discontinuous interpolations. The interface is explicitly tracked using the arbitrary Lagrangian-Eulerian (ALE) technique, wherein the grid at the interface is constrained to move with the interface.

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