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Sharp-interface conditions for fluid-fluid systems undergoing phase transformation DANIEL ANDERSON, George Mason University, PAOLO CERMELLI, University of Torino, ELIOT FRIED, Washington University in St. Louis, MORTON GURTIN, Carnegie Mellon University, GEOFFREY MCFADDEN, National Institute of Standards and Technology — In the simplest models for the solidification of a pure material, the interface conditions at the solid-liquid interface include a balance of energy – i.e. the jump in heat flux across the interface is balanced by the release of latent heat at the interface – and a statement that the interface temperature is the equilibrium melting temperature of the substance. Such is the case in the classical Stefan problem. More sophisticated models of solidification adopt the Gibbs-Thomson equation, which recognizes that the interface temperature may depart from this equilibrium melting temperature due to curvature of the interface. Through the consideration of configurational forces in a thermodynamic framework, we obtain interfacial conditions for a fluid-fluid system undergoing phase transformation. In particular, we identify the counterpart of the Gibbs-Thomson equation. Our model equations include the effects of density difference between the phases, applied pressure, interfacial energy and kinetics, bulk viscosity, and interfacial viscosity. We discuss solutions to these equations for a problem involving the condensation of a liquid droplet within the vapor phase.

Daniel Anderson
George Mason University

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