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A pressure-induced phase-transition from liquid to solid in Water[1] DANIEL ORLIKOWSKI, LLNL, JEFFREY H. NGUYEN, NEIL C. HOLMES — In connection with recent isentropic experiments on water where a functionally graded impactor in a light-gas gun is used to systematically probe the high-pressure meltline for water, hydrodynamic simulations of water undergoing a pressure-induced phase transition into its ice phase are presented. From a well defined set of initial conditions, the liquid system is isentropically compressed into its solid phase, thus a mitigating first-order phase transitions occurs during which the energy of the system increases. Specifically, the simulations use a tabular, single-phase equation of state (EOS) for each phase. We use a thermodynamic mixing scheme of single-phase equations of state to treat mixed phase regions. In this scheme a time constant is related to the phase transition rate which incorporates the underlying effects of kinetics. The simulation models in one dimension the entire experimental setup, accounting for the wave interactions throughout the impactor and target. The calculated results are directly compared with particle velocity records from the experiment.

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