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Dynamics of volumetrically heated matter passing through the liquid-vapor metastable states

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Remaining within the pure hydrodynamic approach, we formulate a self-consistent model for simulating the dynamic behavior of matter passing through metastable states in the two-phase liquid-vapor region of the phase diagram. The model is based on the local criterion of explosive boiling, derived by applying the theory of homogeneous bubble nucleation in superheated liquids. Practical application of the proposed model is illustrated with hydrodynamic simulations of a volumetrically uniformly heated planar layer of fused silica SiO2. Implications for experimentally measurable quantities are briefly discussed. A newly developed equation of state, based on the well known QEOS model and capable of handling homogeneous mixtures of elements, was used in the numerical simulations.

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