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A mean-field thermodynamic description of the kinetics of overdriven interfaces.[1] TOMORR HAXHIMALI, JONATHAN BELOF, BABAK SADIGH, Lawrence Livermore National Laboratory — A key aspect of an accurate description of shock-induced structural phase transitions is the rigorous computation of the dynamics of the interfaces between coexisting phases. In the wake of the shock, the system will be exposed to strong gradient fields that give rise to overdriven interfaces during the induced phase transformation. In this work we take a mean-field approach using a time-dependent Ginzburg-Landau formalism to describe the dynamics of such overdriven interfaces. We make a connection of the mean-field result to a quasi-Langevin description, the Kardar-Parisi-Zhang (KPZ) equation, of the kinetics of the interface. Further, larger coarse-grained descriptions of the phase transition such as the Kolmogorov-Johnson-Mehl-Avrami (KJMA) model, which are commonly coupled to hydrodynamic equations that describe the evolution of the temperature and pressure during the shock propagation, ignore the details of the dynamics and structure of the interfacial regions. Overlaying the KPZ description of the interface evolution to these coarse-grained methods will result in physically more accurate multiscale models for shock propagation. We will present results from our efforts in this regard.

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