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Richtmyer-Meshkov instability induced by strong shocks[1] MILOS STANIC, University of Alabama, Huntsville, AL, USA, ROBERT STELLINGVERF, Srellingverf Consulting, Huntsville, AL, USA, JASON CASSIBRY, University of Alabama, Huntsville, USA, SNEZHANA ABARZHI, University of Chicago, Chicago, IL, USA — We systematically study the Richtmyer-Meshkov instability (RMI) induced by strong shocks for fluids with contrasting densities and with small and large amplitude initial perturbations imposed at the fluid interface. The Smoothed particle hydrodynamics code (SPHC) is employed to ensure accurate shock capturing, interface tracking, and accounting for the dissipation processes. Simulations results achieve good agreement with existing experiments and with the theoretical analyses including zero-order theory describing the post-shock background motion of the fluids, linear theory providing RMI growth-rate in a broad range of the Mach and Atwood numbers, weakly nonlinear theory accounting for the effect of the initial perturbation amplitude on RMI growth-rate, and highly nonlinear theory describing evolution of RM bubble front. We find that for strong-shock-driven RMI the background motion is supersonic, and the interfacial mixing can be sub-sonic or supersonic. Significant part of the shock energy goes into compression and background motion of the fluids, and only a small portion remains for interfacial mixing. The initial perturbation amplitude appears a key factor of RMI evolution. It strongly influences the dynamics of the interface, in the fluid bulk, and the transmitted shock.

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