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Scale coupling in Richtmyer-Meshkov flows induced by strong shocks[1] R.F. STELLINGVERF, Stellingverf Consulting, Huntsville, AL, USA, M. STANIC, J.T. CASSIBRY, University of Alabama, Huntsville, USA, S.I. ABARZHI, University of Chicago, Chicago, IL, USA — We report an integrated study of the Richtmyer-Meshkov (RM) flows under high energy density relevant conditions by means of smoothed particle hydrodynamics simulations and theoretical analysis. We show that significant amount of the shock energy goes into the compression and background of the fluids (that is supersonic), and only a small portion remains for interfacial mixing (that can be sub-sonic or supersonic). At late times, the RM bubbles flatten and decelerate, specific drag force decays quickly, the interfacial motion tends to be inertial, and the flow remains laminar rather than turbulent. At early times, shear-driven Kelvin-Helmholtz structures appear at the interface. At late times the velocity field is non-uniform and is characterized by intense dynamics in a vicinity of the front, effectively no motion in the bulk (rather than the background motion), and the checkerboard velocity patterns, which are induced by reverse cumulative jets. These jets appear in the fluid bulk and are accompanied by hot spots - local heterogeneous microstructures with temperature substantially higher than that in the ambient. Our results show that RMI dynamics is a multi-scale and heterogeneous process with a complicated character of scale coupling at the interface and in the bulk.

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