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Comparative simulations of microjetting using atomistic and continuous approaches in presence of viscosity and surface tension OLIVIER DURAND, LAURENT SOULARD, STEPHANE JAOUEN, OLIVIER HEUZE, LAURENT COLOMBET, EMMANUEL CIEREN, CEA, DAM, DIF — We compare, at similar scales, the processes of microjetting and ejecta production from shocked roughened metal surfaces by using atomistic and continuous approaches. The atomistic approach is based on very large scale molecular dynamics (MD) simulations. The continuous approach is based on Eulerian hydrodynamics simulations with adaptive mesh refinement; the simulations take into account the effects of viscosity and surface tension, and they use an equation of state calculated from the MD simulations. The microjetting is generated by shock-loading above its fusion point a three-dimensional tin crystal with an initial sinusoidal free surface perturbation, the crystal being set in contact with a vacuum. Several samples with homothetic wavelengths and amplitudes of defect are simulated in order to investigate the influence of the viscosity and surface tension of the metal. The simulations show that the hydrodynamic code reproduces with a very good agreement the distributions, calculated from the MD simulations, of the ejected mass and velocity along the jet. Both codes exhibit also a similar phenomenology of fragmentation of the metallic liquid sheets ejected.

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