

Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Molecular dynamics simulations of the surface instability in a shock loaded copper S.V. ZYBIN, Caltech, E.M. BRINGA, LLNL, S.I. ABARZHI, Stanford Univ., B. REMINGTON, LLNL — We report the preliminary results of the molecular dynamics (MD) simulations of the growth of surface perturbations in copper, which is a subject to impulsive acceleration caused by the shock passage. The simulations indicate the developments of the Richtmyer-Meshkov instability at the interface between two solids in the limiting case of the density of the light solid approaching zero (i.e. the Atwood number $A = 1$). MD accounts for the physical nonlinearities and as well as non-equilibrium character of the energy and mass transfers typical for the shock compression. At the same time, MD numerical method does not use empirical assumptions of the equation of state, the tensor of elastic constants and the properties of shear stress, in contrast to hydrodynamics simulations with elastic-plastic constitutive model. We apply MD simulations to determine the critical values of the perturbation wavelength and the shock velocity, to study the plastic flow and the dynamics of dislocations at nano-scales, and to find their relations to the von Mises plasticity criterion, material strength, and the time evolution of the perturbation growth.

Sergey Zybin
California Institute of Technology

Date submitted: 08 Apr 2005

Electronic form version 1.4