Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Surface Roughness Effects on Ejecta Production[1] TIMOTHY C. GERMANN, JAMES E. HAMMERBERG, BRAD LEE HOLIAN, Los Alamos National Laboratory, RAMON RAVELO, University of Texas - El Paso — We utilize large-scale classical molecular dynamics simulations with embedded atom method (EAM) potentials to investigate the effects of surface roughness on the ejection of material when a shock wave releases from a free surface. There are (at least) three regimes which, in principle, can lead to different mechanisms of ejecta production: (1) shock compression and release both occur in the solid phase; (2) the shocked state is solid, but melts upon release; and (3) the shocked state is liquid (or mixed-phase). For a perfect Cu surface (Germann, Hammerberg, and Holian, SCCM 03), a continuous increase in ejecta mass is seen, from single atoms and clusters at dislocation intersections in the plastic regime (1), to on the order of a monolayer of ejecta upon shock melting (case 3). With surface imperfections such as machining grooves, ejecta production is completely dominated by hydrodynamic jetting phenomena in both regimes (2) and (3).

[1]Los Alamos National Laboratory is operated by the University of California for the U.S. Department of Energy under contract no. W-7405-ENG-36.

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Date submitted: 11 Apr 2005 Electronic form version 1.4