Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Directional-dependence in shock-induced melting of fcc metals RAMON RAVELO, Univ. of Texas-El Paso, BRAD HOLIAN, TIMOTHY GERMANN, PETER LOMDAHL, Los Alamos National Laboratory — We report on simulations of shock-induced melting in fcc single crystals as function of shock direction. The solid-liquid Hugoniot of Al, Cu and Lennard-Jones crystals was generated for shock waves propagating along the (100),(111) and (110) crystallographic directions utilizing large-scale non-equilibirum molecular dynamics (NEMD) simulations as well as a new equilibrium molecular dynamics method for following the dynamical evolution of condensed matter subjected to shock waves[1]. In these three systems, it is found that the shear stresses at the shock-front dominate the melting process. As a function of orientation, melting occurs at lower pressures (temperatures) for (110) shocks and at higher pressures (temperatures) for (100) shocks. The magnitude of the shear stress at the melting pressure correlates with the orientations:(100):(111):(110), with (100) shocks exhibiting the smallest value and (110) shocks the largest.

[1]R. Ravelo, B.L. Holian, T.C. Germann and P.S. Lomdahl, Phys Rev B, 70, 014103 (2004).

Ramon Ravelo
Univ. of Texas- El Paso

Date submitted: 08 Apr 2005 Electronic form version 1.4