Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Shock Response of Cu-Nb Nanolayer Composites[1] RUIFENG ZHANG, JIAN WANG, XIANG-YANG LIU, SHENGNIAN LUO, TIMOTHY C. GERMANN, Los Alamos National Laboratory — Large-scale classical molecular dynamics (MD) simulations are used to study the shock response of Cu-Nb nanolayered composites. We describe the development of an interatomic potential which provides an accurate description of deformation twinning in bcc Nb under compression, slip in fcc Cu, and the interface structure of Cu-Nb interfaces with the Kurdjumov-Sachs (KS) orientation relationship. The MD simulations provide insight into the role of atomic Cu-Nb interface structures on the nucleation, transmission, absorption, and storage of dislocations during shock compression, and their role as dislocation sinks upon release. This, together with the effects of confined layer slip and twinning, leads to a greater degree of recovery as compared to either constituent Cu or Nb single crystal for layer thicknesses down to 5 nm, an effect seen both in our simulations and in companion shock experiments.

[1]Supported by the Center for Materials at Irradiation and Mechanical Extremes, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Award Number 2008LANL1026

Tim Germann
Los Alamos National Laboratory

Date submitted: 23 Feb 2011 Electronic form version 1.4