Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Role of Interface on Shock Response of Cu-Nb Nanolaminate Composites RUIFENG ZHANG, T.C. GERMANN, I.J. BEYERLEIN, X.Y. LIU, JIAN WANG, Los Alamos National Lab — Using newly constructed interatomic potential for Cu-Nb system, large-scale molecular dynamics simulations are performed on two interfaces, Kurdjumov-Sachs {111}Cu||{110}Nb (KS) and {112}KS orientation relationship, to provide insight into the role of interface structure on the nucleation, transmission, absorption, and storage of dislocations during shock compression. We found that Shockley partials prefer to nucleate from the interface and then transmit into the neighboring layers when the layer thicknesses are lower than 10 nm, controlling their plasticity. The preferred nucleation sites are found to be closely associated with the interface misfit dislocation structures, and dislocation transmission abides by the geometrical compatibility of pairs of slip systems of adjoining crystals. Critical shock pressures to nucleate from and transmit dislocations across the atomically flat interface are shown to be substantially higher than those for the faceted interface. We discuss the atomic-level interface characteristics that cause these two types of interfaces to nucleate and transmit dislocations by significantly different mechanisms.

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Date submitted: 25 Feb 2013 Electronic form version 1.4