Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Measurement of the Orientation Dependence of the Principle Shock Hugoniot in Copper PALAKKAL ASOKA-KUMAR, JAMES STOLKEN, RICKY CHAU, NEIL HOLMES, MUKUL KUMAR, Lawrence Livermore National Lab — Recent advances in multi-scale modeling suggest that the influence of material microstructure on the shock response of polycrystalline metals may be significant. Numerous large-scale molecular dynamics (MD) simulations, using a variety of different inter-atomic potentials, have consistently predicted a strong orientation dependence for the shock response of metallic single crystals. The slopes of the predicted shock velocity vs particle velocity curves vary nearly 50% as a function of orientation with simulated shock pressures in the 100 – 500 kbar regime. To the best of our knowledge a detailed study of this orientation dependence has not been performed and therefore no complementary experimental data exists to compare with the results of the aforementioned MD simulations. In order to address this issue, the principle shock hugoniot has been measured for three orientations ([100], [110], and [111]) of very high purity copper single crystals over a pressure range of 100 to 400 kbar. The implications on the crystallographic texture dependence of equations-of-state for polycrystalline metals are explored and the application of these results to the analysis of single crystal spall experiments shall also be discussed. This work was performed under the auspices of the U. S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

Roger Minich
Lawrence Livemore National Lab

Date submitted: 11 Apr 2005 Electronic form version 1.4