Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Material deformation dynamics at ultrahigh pressures and strain rates[1] B.A. REMINGTON, H.S. PARK, B.R. MADDOX, M.J. MAY, S.M. POLLAINE, S.T. PRISBREY, R.E. RUDD, J.A. HAWRELIAK, T.S. PERRY, LLNL, A.J. COMLEY, AWE, J.S. WARK, Univ. Oxford, M.A. MEYERS, UCSD — Solid-state dynamics experiments at extreme pressures, up to 10 Mbar, and strain rates (1.e6 -1.e8 1/s) are being developed for the NIF laser. The experimental methods are being developed on the Omega laser facility. VISAR measurements establish the ramped, high-pressure conditions. Recovery experiments offer a look at the residual microstructure. Dynamic diffraction measurements allow phase, shear stress (strength), and possibly twin volume fraction and dislocation density to be inferred. Constitutive models for material strength at these conditions by comparing 2D simulations with experiments measuring the Rayleigh-Taylor instability evolution in solid-state samples of vanadium and tantalum. The material deformation likely falls into the phonon drag regime. We estimate of the (microscopic) phonon drag coefficient, by relating to the (macroscopic) effective lattice viscosity.

[1]This work was performed under the auspices of the Lawrence Livermore National Security, LLC, (LLNS) under Contract No. DE-AC52-07NA27344.

B.A. Remington
LLNL

Date submitted: 01 Sep 2010 Electronic form version 1.4