Abstract Submitted
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Modeling of Laser-Driven High-Rate Deformation of BCC Tantalum and Lead[1] ROBERT RUDD, A. ARSENLIS, R. M. CAVALLO, J. MCNANEY, S. T. PRISBREY, B. A. REMINGTON, C. E. WEHRENBERG, H.-S. PARK, Lawrence Livermore National Lab, P. GRAHAM, AWE — Multiscale strength models for high-rate deformation have been developed for tantalum and other metals starting with atomic bonding and extending up through the mobility of individual dislocations, the evolution of dislocation networks and so on until the ultimate material response at lab scale. This LMS model [1] can be run in continuum simulations. High-energy laser platforms such as the National Ignition Facility can probe plasticity at extremely high rates in largely shock-free ramp-compression waves. [2] Experiments on Ta at pressures of ~1 Mbar and strain rates of ~10^7/s agreed well with the LMS model. [3-4] We examine recent results that suggest the reliance of the model on a simple pressure scaling based on the shear modulus is not sufficient in the range 3.5-5.0 Mbar. We also discuss a simpler strength model for the body-centered cubic (BCC) phase of lead in the range 3.5-5.0 Mbar. [1] N.R. Barton et al., J. Appl. Phys. **109**, 073501 (2011). [2] R.E. Rudd et al., MRS Bulletin **35**, 999 (2010). [3] H.-S. Park et al., Phys. Rev. Lett., **114**, 065502 (2015). [4] R.E. Rudd et al., AIP Conf. Proc. **1793**, 110004 (2017).

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