Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

The plastic response of Tantalum in Quasi-Isentropic Compression Ramp and Release[1] ALEXANDER MOORE, JUSTIN BROWN, HOJUN LIM, J. MATTHEW D. LANE, Sandia National Laboratories, Albuquerque, NM 87185 — The mechanical response of various forms of tantalum under extreme pressures and strain rates is studied using dynamic quasi-isentropic compression loading conditions in atomistic simulations. Ramp compression in bcc metals under these conditions tend to show a significant strengthening effect with increasing pressure; however, due to limitations of experimental methods in such regimes, the underlying physics for this phenomenon is not well understood. Molecular dynamics simulations provide important information about the plasticity mechanisms and can be used to investigate this strengthening. MD simulations are performed on nanocrystalline Ta and single crystal defective Ta with dislocations and point defects to uncover how the material responds and the underlying plasticity mechanisms. The different systems of solid Ta are seen to plastically deform through different mechanisms. Fundamental understanding of tantalum plasticity in these high pressure and strain rate regimes is needed to model and fully understand experimental results.

[1]Sandia National Labs is a multi program laboratory managed and operated by Sandia Corp., a wholly owned subsidiary of Lockheed Martin Corp., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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Date submitted: 23 Feb 2017 Electronic form version 1.4