Abstract Submitted
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Modeling High Strain Rate Plasticity in High-Pressure Lead and Tin[1] ROBERT RUDD, LIN YANG, ANDREW G. KRYGIER, CAMELIA V. STAN, PHILIP D. POWELL, DAMIAN SWIFT, BRUCE A. REMINGTON, JAMES M. MCNANEY, HYE-SOOK PARK, Lawrence Livermore Natl Lab, PETER GRAHAM, AWE, MATTHEW P. HILL, Lawrence Livermore Natl Lab — Experiments conducted at the National Ignition Facility and the Omega laser have used plasma-driven ramp compression to induce strength-dependent Rayleigh-Taylor instability allowing us infer strength in solid body-centered cubic (bcc) lead and lead alloy at high pressure [1]. Experiments are underway for bcc tin. Here we model the strength (flow stress) of lead and tin at high pressure. Previous models were built from data in the ambient-pressure phase. Plasticity in bcc can be very different. We have developed Improved Steinberg-Guinan models for bcc lead strength [2] and tin strength using ab initio calculations of the shear modulus at pressure. The lead model agrees well with those experiments. The lead alloying, which increases strength 4x at ambient conditions, has no measurable effect at high-pressure. [1] A. Krygier et al., Phys. Rev. Lett., 123, 205701 (2019). [2] R.E. Rudd et al., AIP Conf. Proc. 1979, 070027 (2018).

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