Abstract Submitted
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Lattice Stability and Interatomic Potential of Non-equilibrium Warm Dense Gold Z. CHEN, M. MO, SLAC National Accelerator Laboratory, L. SOULARD, V. RECOULES, CEA DAM DIF, P. HERING, SLAC National Accelerator Laboratory, Y.Y. TSUI, University of Alberta, A. NG, University of British Columbia, S.H. GLENZER, SLAC National Accelerator Laboratory — Interatomic potential is central to the calculation and understanding of the properties of matter. A manifestation of interatomic potential is lattice stability[1] in the solid-liquid transition. Recently, we have used frequency domain interferometry (FDI) to study the disassembly of ultrafast laser heated warm dense gold nanofoils. The FDI measurement is implemented by a spatial chirped single-shot technique. The disassembly of the sample is characterized by the change in phase shift of the reflected probe resulted from hydrodynamic expansion. The experimental data is compared with the results of two-temperature molecular dynamic simulations based on a highly optimized embedded-atom-method (EAM) interatomic potential[2]. Good agreement is found for absorbed energy densities of 0.9 to 4.3MJ/kg. This provides the first demonstration of the applicability of an EAM interatomic potential in the non-equilibrium warm dense matter regime. The MD simulations also reveal the critical role of pressure waves in solid-liquid transition in ultrafast laser heated nanofoils. This work is supported by DOE Office of Science, Fusion Energy Science under FWP 100182, and SLAC LDRD program

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