Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Crystal Structure and Reflectivity of Laser Ramp-Compressed Sodium DANAE POLSIN, Laboratory for Laser Energetics, XUCHEN GONG, LINDA CRANDALL, MARGARET HUFF, University of Rochester, THOMAS BOEHLY, Laboratory for Laser Energetics, GILBERT COLLINS, University of Rochester, JON EGGERT, AMY LAZICKI, MARIUS MILLOT, Lawrence Livermore National Laboratory, MALCOLM MCMAHON, University of Edinburgh, JAMES RYGG, University of Rochester — Extreme compression can alter the free-electron behavior of "simple" metals such as Na. At pressures exceeding 200 GPa, Na was observed to become transparent to visible light under static compression; first-principles calculations suggest this is caused by a transformation to an electride phase where electrons are localized in interstitial positions. Laser-driven ramp compression is used to compress Na into an unexplored pressure regime to investigate the crystalline structure, reflectivity, and melting behavior of Na. X-ray diffraction is used to constrain the crystalline structure and detect melting. Optical reflectivity measurements at 532 nm are used to detect a transition to the predicted insulating electride phase. We show the highest-pressure solid x-ray diffraction and reflectivity data on Na to date. A simple semiconducting Drude picture is used to constrain the band gap and temperature of dense Na. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856, the University of Rochester, and the New York State Energy Research and Development Authority.

Danae Polsin
Laboratory for Laser Energetics

Date submitted: 28 Feb 2019 Electronic form version 1.4