Abstract Submitted
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Observation of metallic helium: Equation of state and transport measurements under astrophysical conditions[1] P.M. CELLIERS, J.H. EGGERT, LLNL, P.A. LOUBEYRE, S. BRYGOO, CEA, R.S. MCWILLIAMS, U.C. Berkeley, D.G. HICKS, LLNL, T.R. BOEHLY, University of Rochester, R. JEANLOZ, U.C. Berkeley, G.W. COLLINS, LLNL — The equation of state and opacity of warm dense helium ($1 < \rho < 10$ g/cm^3, $0.5 < T < 5$ eV) is essential for addressing a variety of astrophysical problems. High-pressure experimental data on dense helium are sparse; models used by the astrophysical community have been calibrated against a small number of gas-gun measurements much below 1 g/cm^3. Using coupled static- and dynamic-compression techniques it is becoming feasible to recreate the conditions of giant planetary interiors in laboratory; in recent experiments we have compressed helium to over 1.2 g/cm^3. We present measurements of pressure, temperature, density, and reflectivity of compressed helium using quartz as a reference material for impedance matching. Reflectivity data at these conditions show that helium is not a clear dielectric fluid but reflects like a metal. The pressure for this transition is almost independent of temperature, as would be expected for pressure-induced ionization, but it occurs at pressures 1-2 orders of magnitude lower than theoretically expected for the T = 0 K solid or fluid.

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