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Transformation of Simple Molecular Fluids to Conducting States in the Laser-Heated Diamond Anvil Cell R.S. MCWILLIAMS, Geophysical Laboratory, Carnegie Institution of Washington, Washington D.C, 20015, D.A. DALTON, Defense Threat Reduction Agency, Fort Belvoir, V.A., 22060, M.F. MAHMOOD, Howard University, Washington D.C., 20059, A.F. GONCHAROV, Geophysical Laboratory, Carnegie Institution of Washington, Washington D.C, 20015 — The nature of high-pressure, high-temperature chemical and electronic transformation of simple molecular materials such as hydrogen and nitrogen is a subject of ongoing study and many open questions. Particularly challenging is the laboratory study of states corresponding with fluid-fluid phase transformations, from insulator to conductor and/or molecular to non-molecular. These may take the form of first-order (i.e. discontinuous in P and T) phase boundaries at conditions yet to be explored completely by experiments. Previously, such states were accessible solely via dynamic compression techniques, however limitations in experimental geometry and timescale and confinement to adiabatic pathways has limited the range of conditions accessed and the variety of measurements available. New developments in static compression, involving the acceleration of laser-heated diamond-anvil-cell experiments to microsecond timescales via fast spectroscopy, enable study of this interesting regime in hydrogen and nitrogen as well as novel measurements of material state. These results complement dynamic compression data and extend measurements to previously unexplored conditions where first-order liquid-liquid transformations have been predicted.

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