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Ultrafast shock wave propagation at high ambient pressure in a diamond anvil cell[1] MICHAEL ARMSTRONG, Lawrence Livermore National Lab, JONATHAN CROWHURST, JOSEPH ZAUG, WILLIAM HOWARD — The measurement and characterization of acoustic phenomena at high pressure is critical to the modeling of planetary dynamics, seismic events, and chemistry in extreme environments. Here we present the results of experiments using ultrafast laser excitation and detection of shock waves starting from high precompression (10s GPa) in a standard diamond anvil cell (DAC) with transient single shot shock pressures > 10 GPa. Using ultrafast interferometry, we directly detect surface motion with $\sim$nm spatial resolution and $\sim$ps time resolution. Such experiments enable examination of shock waves with significant strain starting at high ambient pressure using a convenient and relatively inexpensive apparatus. Ultrafast time resolution enables the observation of shock-induced chemistry on the scale of a picosecond shock rise. Furthermore, standard DACs can reach 100s GPa precompression, enabling the examination of phase transitions and chemical reactions starting from a wide range of thermodynamic initial conditions.

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