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Ultrafast shock wave dynamics at high ambient pressure (∼10 GPa) in a diamond anvil cell[1] MICHAEL ARMSTRONG, JONATHAN CROWHURST, JOSEPH ZAUG, EVAN REED, WILLIAM HOWARD, Lawrence Livermore National Laboratory — The measurement and characterization of acoustic phenomena at high pressure is critical to the modelling 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 in metals in a diamond anvil cell (DAC) at ambient pressure up to at least10 GPa. Using ultrafast interferometry, we directly detect surface motion with less than 1 nm spatial resolution with 100 femtosecond time resolution. Notably, these experiments do not destroy the DAC, allowing multiple shot experiments at multiple pressures for a single DAC load. Such experiments enable examination of acoustic waves with significant strain (∼1%) starting at high ambient static pressure using a convenient, reusable and inexpensive apparatus.

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