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Ultrafast observation of shock compression from greater than 10 GPa precompression[1] MICHAEL ARMSTRONG, LLNL, JONATHAN CROWHURST, JOSEPH ZAUG — For decades, many compression experiments have applied either static compression in a diamond anvil cell (DAC) or dynamic compression using shock waves. Although such experiments provide a wide range of material data, information off the Hugoniot or room temperature isotherm requires more specialized techniques. Further, although ultrafast laser methods have recently been applied to acoustics in the DAC and shock waves at ambient pressure, shock waves from precompressed states have not been observed with ultrafast time resolution. Shock compression of a precompressed material enables two useful experimental strategies. First, the initial state of the material may be placed, via precompression, in the proximity of a phase transition before shock compression, enabling the observation of phase transition dynamics as the material is shock compressed through the phase transition boundary. Second, since low-density materials heat more substantially than high-density materials upon shock compression, an initial pressure may be used to modulate the degree of shock heating. Here we report the application of ultrafast shock wave methods to materials which have been precompressed in a DAC, providing material information off the standard Hugoniot.

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