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Direct measurements of temperature and phase transitions along the MgO shock Hugoniot

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Laser-driven shock compression enables experimental study of material properties at extraordinary pressures and temperatures. Experiments that probe these extreme conditions are conducted at timescales approaching the limits of atomic mobility, convoluting kinetic effects into observations of phase transitions. In this talk, I will present a suite of studies of the MgO Hugoniot aimed at constraining the phase diagram, comparing effects of crystallographic orientation, timescale (decaying vs steady shocks), and x-ray vs pyrometry diagnostics. I will discuss the implications of this work for our understanding of phase transitions under dynamic compression and our ability to experimentally extricate thermodynamics from dynamics.