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Optical Properties of Shock-compressed Materials REED PATTERSON, JEFF NGUYEN, JOHN KLEPEIS, LORIN BENEDICT, NEIL HOLMES, Lawrence Livermore National Laboratory — Real-time *in-situ* measurements of complex optical constants during dynamic compression experiments provide a wealth of information beyond standard Hugoniot-EoS or sound speed measurements. At LLNL we have developed an ellipsometer for use on our two-stage light-gas gun, giving us the ability to measure the indices of refraction of shocked materials. Optical constants not only provide information about the existence of phase transformations, but also can be coupled with calculations to propose high pressure - high temperature crystal structures, yielding phase diagram information. Time-resolved ellipsometric measurements can potentially be used to extract information about the dynamic behavior of materials such as the kinetics of phase transitions, or elastic/plastic deformation/relaxation rates. We have observed solid-solid or solid-liquid phase transitions in Fe,Sn, and Bi as well as stress-induced birefringence in LiF. We will also discuss the implications of time-dependent phenomenon such as lattice relaxation in LiF.

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