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Ellipsometry of Shocked Crystals: Birefringence and Relaxation of LiF REED PATTERSON, LLNL, JEFFREY NGUYEN, LLNL, NEIL HOLMES, LLNL — Ellipsometry measurements on dynamically compressed materials present a novel technique for characterizing the behavior of materials at extreme conditions. Such measurements yield information about dielectric and strain properties which in turn provide insight into the dynamic behavior of materials, e.g. plasticity, phase transitions, strength, crystal structure, etc. Previous ellipsometry measurements on shocked LiF at the two-stage light-gas gun at LLNL have shown strain-induced birefringence. In addition, these measurements suggest that LiF does not relax immediately from a uniaxially compressed state to the hydrostat, as suggested by recent x-ray data, but that there is a time scale associated with the relaxation of the crystal lattice following the shock. Coupling time-resolved optical measurements of the refractive indices with the stress tensor will allow us to develop a better understanding of the origin and kinetics of plasticity and phase transitions in addition to yielding valuable structural data on high-pressure high-temperature materials.

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