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Investigations into rapid uniaxial compression of polycrystalline targets using femtosecond X-ray diffraction DAVID MCGONEGLE, ANDREW HIGGINBOTHAM, SAM VINKO, JUSTIN WARK, University of Oxford, UK, ERIC GALTIER, HAE-JA LEE, DESPINA MILATHIANAKI, BOB NAGLER, LCLS, SLAC, EMMA MCBRIDE, MALCOLM MCMAHON, University of Edinburgh, UK — When a material is uniaxially shock or ramp compressed to high pressures on ultrafast timescales, the rate at which the lattice response occurs can compete with the kinetics of the plasticity, and thus the material can deviate greatly from a hydrostatic response, and the assumption that the difference between the longitudinal and transverse strains in a sample remains small becomes increasingly invalid. We present analysis of X-ray diffraction data from laser shocked polycrystalline targets subjected to large strains, as well as large strain anisotropies, factors of which many existing models fail to correctly take account. We demonstrate that by breaking the symmetry of the experiment, using a tilted target geometry, it is possible to measure these strain anisotropies in a polycrystal. We present data acquired using this technique performed on the MEC beamline at LCLS, and discuss possible future experiments, such as investigations into the Voigt-Reuss parameter using such emerging 4th generation light sources.

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