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Elastic-plastic behavior in laser-shock-compressed Mo using time-resolved 17 keV Bragg diffraction BRIAN MADDOX, NATHAN BARTON, HYE-SOOK PARK, SHON PRISBREY, ALLEN ELSHOLZ, JAMES HAWRELIAK, RICK GROSS, ROBERT RUDD, BRUCE REMINGTON, Lawrence Livermore National Laboratory, ANDREW COMLEY, AWE — Time-resolve diffraction during the rapid loading of crystalline samples is fast becoming a powerful new tool for diagnosing the lattice dynamics of materials under high-pressure, high-strain rate conditions. The information contained in this diffraction data can yield important information about the sample including strength, phase, and timescales associated with dislocation-driven plastic deformation. We have developed high-energy, time-resolved Bragg diffraction on the Omega EP laser using a short-pulse driven Kα backlighter as the gated x-ray source. We used the 17 keV x-rays from a Mo foil backlighter to probe shock-compressed Mo (111) single crystals as a function of time and pressure from 0.08 Mbar to 0.37 Mbar. We find that at low shock pressure ($<$0.15 Mbar) the lattice response is essentially elastic with a transition to plastically relaxed behavior above 0.15 Mbar. We also put an upper bound on the plastic relaxation timescale that is consistent with similar measurements of BCC Ta using time-resolved diffraction (see Comley *et al.*). We also infer the shear strength above the plastic transition as a function of pressure up to 0.37 Mbar on the hugoniot.

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