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Measuring twinning and slip in shock-compressed Ta from in-situ x-ray diffraction[1] CHRISTOPHER WEHRENBERG, Lawrence Livermore National Laboratory, DAVID MCGONEGLE, MARCIN SLIWA, MATT SUGGIT, JUSTIN WARK, University of Oxford, HAE JA LEE, BOB NAGLER, FRANZ TAVELLA, Stanford Linear Accelerator, BRUCE REMINGTON, ROB RUDD, AMY LAZICKI, HYE-SOOK PARK, DAMIAN SWIFT, LOUIS ZEPEDA-RUIZ, Lawrence Livermore National Laboratory, ANDREW HIGGINBOTHAM, University of York, CINDY BOLME, Los Alamos National Laboratory — A fundamental understanding of high-pressure and high-strain-rate deformation rests on grasping the underlying microstructural processes, such as twinning and dislocation generation and transport (slip), yet simulations and *ex-post-facto* recovery experiments provide conflicting answers to these basic issues. Here, we report direct, in-situ observation of twinning and slip in shock compressed Ta using in-situ x-ray diffraction. A series of shock experiments were performed on the Matter in Extreme Conditions end station at LCLS. Direct laser ablation was used to drive a shock, ranging in pressure from 10-300 GPa, into a Ta sample with an initial (110) fiber texture. The subsequent changes in texture were observed in-situ by examining the azimuthal distribution of the diffraction intensity and found to match twinning and lattice rotation. Measurements of the twin fraction and lattice rotation were used to calculate the equivalent plastic strain from twinning and slip.

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