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X-ray diffraction techniques for in-situ measurements of the dynamic flow stress of shock compressed Ta[1] CHRISTOPHER WEHRENBERG, NATHAN BARTON, Lawrence Livermore National Laboratory, ANDREW COMLEY, Atomic Weapons Establishment, DAVID MCGONEGLE, Oxford University, BRIAN MADDOX, JAMES MCNANEY, HYE-SOOK PARK, CHRIS PLECHATY, SHON PRISBREY, BRUCE REMINGTON, ROB RUDD, Lawrence Livermore National Laboratory — A range of experimental techniques using in-situ x-ray diffraction have been developed to study the dynamic flow stress and underlying deformation of shock compressed samples. Experiments performed at the Omega and Omega EP facilities can generate both a high pressure drive, ranging from 0.3 Mbar up to and beyond the Hugoniot melt line, while simultaneous providing a short, bright x-ray source. Single crystal samples were studied either by Laue diffraction, using a broadband x-ray source created by an imploding CH capsule, or by Bragg diffraction, using a short pulse driven metal foil backlighter. The strength of polycrystalline samples can be determined using a pinhole camera setup and a quasi-monochromatic source. For highly-textured polycrystalline samples, additional strength information can be inferred from the azimuthal position of the texture spots on the Debye ring. Through measurements of the 1D-to-3D relaxation time or changes in the observed texture, information about the deformation mechanics of shock loading can be inferred.

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