Abstract Submitted
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Direct observation of the alpha-epsilon phase transformation in shocked single crystal iron[1] DANIEL H. KALANTAR, G. COLLINS, J.D. COLVIN, J.H. EGGERT, H.E. LORENZANA, J.S. STOLKEN, LLNL, J. HAWRELIAK, K. ROSOLANKOVA, J.S. WARK, Univ. of Oxford, M. SCHNEIDER, M.A. MEYERS, UCSD — The technique of in-situ wide angle diffraction provides direct access to study the dynamic deformation of a material during the shock process. This technique has been used to study the shock response of single crystal Fe on a ns time-scale. Single crystals of Fe (001) were shock compressed by direct laser irradiation using the OMEGA, Janus, and Vulcan lasers. The lattice was probed by in-situ diffraction during shock loading at pressures spanning the alpha-epsilon phase transformation at 13 GPa. Simultaneous diffraction from multiple lattice planes provides the first direct evidence that the Fe transforms to an hcp structure on the nanosecond time-scale. The Fe was observed to respond with a uniaxial compression to 6%, with an additional collapse by 15-18% and transformation to the hcp phase. Details on the technique, diffraction wave profile measurements, and methods of analysis will be discussed.

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