Abstract Submitted for the SHOCK09 Meeting of The American Physical Society

Shock-induced hcp to bcc phase transition in polycrystalline Mg¹ D. MILATHIANAKI, D.C. SWIFT, J. HAWRELIAK, B.S. EL-DASHER, J.M. MC-NANEY, H.E. LORENZANA, Lawrence Livermore National Laboratory, Livermore, CA 94550, T. DITMIRE, University of Texas at Austin, Austin, TX 78712 — We report on recent dynamic x-ray diffraction measurements of shocked polycrystalline Mg between 10-50GPa. The experiment was performed at the JANUS laser facility at LLNL utilizing its two high-energy beam capability for nanosecond x-ray production and laser-driven shocks. Samples of polycrystalline rolled Mg foil, 50um thick, were probed by 4.7keV, 3ns x-ray pulses while shocked by 532nm, 20-200J, 6ns laser pulses, over 1mm². A cylindrical x-ray pinhole camera was fielded to measure lattice structure simultaneously with line-imaging velocimetry of the free surface. We present diffraction data suggesting the onset of the hcp to bcc phase transition at 28+/-2GPa on the principal shock Hugoniot, in agreement with the computed phase boundary for Mg. Observation of shocked diffraction lines solely in the bcc phase above 30GPa indicates a subnanosecond phase transition timescale. In addition, the absence of a double shock wave structure in the velocimetry data is attributed to the small volume change expected in the hcp to bcc phase transition in Mg.

¹This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-ABS-410592.

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Date submitted: 24 Feb 2009

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