Abstract Submitted
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Dynamic Compression of Iron Single Crystals B.J. JENSEN, W.W. ANDERSON, R.S. HIXSON, P.A. RIGG, F.J. CHERNE, III, G.T. GRAY, III, LOS ALAMOS NATIONAL LABORATORY COLLABORATION — Iron undergoes a polymorphic phase transformation from alpha phase (bcc) to the epsilon phase (hcp) when compressed to stresses exceeding 130 kbar. Because the epsilon phase is denser than the alpha phase, a single shock wave is unstable and breaks up into an elastic wave, a plastic wave, and a phase transition wave known as the P2 wave. Although there exists a large body of continuum data related to the phase transitions of shocked polycrystalline iron, data for single crystal iron is lacking. Such data are required for a more complete understanding of the response of iron subjected to dynamic loading conditions. The objective of the current work was to examine wave profiles for iron single crystals, oriented along the [100], [110], and [111] directions, subjected to quasi-isentropic loading using the Sandia Z-machine. By comparing the experimentally obtained wave profiles with similar profiles for polycrystalline iron, the orientation dependence of the phase transition stress is determined. Results and implications will be presented.

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