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The Influence of Peak Shock Stress on the High Pressure Phase Transformation in Zirconium ELLEN CERRETA, SARYU FENSIN, JUAN PABLO ESCOBEDO, PAULO RIGG, FRANK ADDESSIO, TURAB LOOKMAN, CURT BRONKHORST, CARL TRUJILLO, DONALD BROWN, PATRICIA DICKERSON, ROBERT FIELD, GEORGE GRAY, Los Alamos National Laboratory — At high pressures zirconium is known to undergo a phase transformation from the hexagonal close packed (HCP) alpha phase to the simple hexagonal omega phase. Under conditions of shock loading, the high-pressure omega phase is retained upon release. However, the hysteresis in this transformation is not well represented by equilibrium phase diagrams and the multi-phase plasticity likely under shock conditions is not well understood. For these reasons, the influence of peak shock stress and temperature on the retention of omega phase in Zr has been explored. In-situ VISAR and PDV measurements along with post-mortem metallographic and neutron diffraction characterization of soft recovered specimens have been utilized to quantify the volume fraction of retained omega phase, characterize the morphology of the shocked alpha and omega phases, and qualitatively understand the kinetics of this transformation. In turn, soft recovered specimens with varying volume fractions of retained omega phase have been utilized to understand the contribution of omega and alpha phases respectively to strength in Zr.

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