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In Situ Investigation of Phase Transformation in Cyclotrimethylene Trinitramine (RDX) During Shock Loading Using X-ray Diffraction KYLE RAMOS, Los Alamos National Laboratory, F.L. ADDESSIO, C.E. ARMENTA, D. BANESH, J.L. BARBER, C.M. BIWER, C.A. BOLME, M.J. CAWKWELL, A.E. GLEASON, A.C. GOLDER, E.L. HARTLINE, D.J. LUSCHER, T.H. PIERCE, R.L. SANDBERG, G.K. WINDLER, LANL, L. DRESSELHAUSCOOPER, MIT, N. SINCLAIR, P. RIGG, APS-DCS, H.J. LEE, I. NAM, M. SEABERG, LCLS-MEC — Particularly important for explosives are the discrete changes in stress-strain rate relationships (e.g. phase boundaries) that have a profound effect on the temperature distribution, on the mechanisms for flow, and hence, on the chemical reactions leading to detonation initiation. The Hugoniot path through phase space for cyclotrimethylene trinitramine (RDX) has been investigated. The equilibrium phase diagrams reported in literature for RDX have a 90 K discrepancy in the triple point between the α, γ, and ε phases. The Hugoniot calculated from volumetric equation of state contributions transits through the region in dispute, and multiple two-wave features have been observed in single crystal velocimetry profiles shocked from 1.5 to 18.5 GPa. In situ x-ray diffraction has been performed to resolve the phase boundaries and identify the phases in single and polycrystalline samples during gas gun and laser-driven shock loading at the Dynamic Compression Sector at the Advanced Photon Source and the Materials in Extreme Conditions instrument at the Linac Coherent Light Source. Direct numerical simulations of the experiments have been performed to assess the effects of transformation kinetics.

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