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Initial Temperature Effects on the Shock Compression and Release Properties of Different Alumina-Filled Epoxy Compositions[1] MARK ANDERSON, DAVID COX, STEPHEN MONTGOMERY, ROBERT SETCHELL, Sandia National Laboratories — Alumina-filled epoxies are composites having constituents with highly dissimilar mechanical properties, resulting in complex behavior during shock compression and release. Two distinguishing characteristics are amplitude-dependent wave structures and high release velocities. Recent studies examined the effects of various compositional changes on these shock properties. As expected, the strongest effects were observed when the total alumina volume fraction was reduced in steps from a nominal 43% to 0%. In the present study, compositions prepared over the same range of alumina loadings were examined at initial temperatures from -50 to 70 °C. Laser interferometry and wave timing were used to obtain transmitted wave profiles, Hugoniot states, and release wave velocities. Initial densities were determined from thermal expansion coefficients measured for each composition. Although initial density changes are very small, significant temperature effects on wave speeds and Hugoniot states were observed.

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