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Deep-release of Epon 828 epoxy from the shock-driven reaction product phase JOHN LANG, ANTHONY FREDENBURG, JOSHUA COE, DANA DATTELBAUM, Los Alamos Natl Lab — A challenge in improving equations-of-state (EOS) for polymers and their product phase is the lack of off-Hugoniot data. Here, we describe a novel experimental approach for obtaining release pathways along isentropes from the shocked products. A series of gas-gun experiments was conducted to obtain release isentropes of the products for 70/30 wt% Epon 828 epoxy resin/Jeffamine T-403 curing agent. Thin epoxy flyers backed by a low-density syntactic foam were impacted into LiF windows at up to 6.3 mm/μs, creating stresses in excess of those required for reaction ($\sim$25 GPa). Following a sustained shock input, a rarefaction fan from the back of the thin flyer reduced the pressure in the epoxy products along a release isentrope. Optical velocimetry (PDV) was used to measure the particle velocity at the epoxy/LiF interface. Numerical simulations using several different EOS describing the reactant-to-product transformation were conducted, and the results were compared with measured wave profiles. The best agreement with experiment was obtained using separate tabular EOS for the polymer reactant (e.g. epoxy) and product mixture, suggesting the transition to the products is irreversible.

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