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Shock Hugoniot Behavior for Particle Reinforced Polymer Composites LOUIS FERRANTI, JR., NARESH THADHANI, Georgia Institute of Technology, JENNIFER JORDAN, RICHARD DICK, Air Force Research Laboratory (AFRL/MNME) — The shock Hugoniot for polymers exhibits a non-linear $U_S - U_P$ relationship at relatively low pressures, showing a concave curvature with an initially rapid shock velocity. In contrast, the shock Hugoniot for a particle reinforced polymer composite displays a convex curvature with initially rapid particle velocity. Transformation to pressure-volume space shows an initial expansion that is not related to a low-pressure phase change or reaction, but rather the decohesion of solid particles from the polymer matrix. We will report on equation of state experiments conducted for epoxy-cast Al+Fe_2O_3 composites showing deviation from ideal Hugoniot behavior as a result of damage evolving at a critical impact stress. Two compositions prepared with significantly different volume fractions of polymer binder phase show damage occurring at approximately the same critical impact stress. The Burch-Murnaghan EOS is used to show the introduction of damage. Further validation of this effect is obtained from a constitutive model for tensile damage and distention (TDD) behavior available in the shock physics code, CTH.

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