Abstract Submitted
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Dynamic Strength and Friction Behavior of Thermosetting Polyurethane and Epoxy[1] PETER SABLE, Marquette University, CHRISTOPHER NEEL, Air Force Research Laboratory, Munitions Directorate, JOHN BORG, Marquette University — Flyer-plate impact experiments were performed on fully-dense polyurethane and epoxy to characterize and model the dynamic material response. Uniaxial and oblique impact configurations were employed to specifically isolate yield strength and friction phenomena at high strain-rate, with impact velocities ranging from less than 50 to 1200 m/s. Oblique impact tests utilized a slotted-barrel gas gun to maintain the orientation of a keyed projectile with an angled face. Upon impact, pressure and shear stress waves were generated creating a combined, off-Hugoniot, stress state within the target. States were then inferred from particle velocity measurements using Photon Doppler Velocimetry. Measured Hugoniots resemble others in literature; including nonlinear effects seen below particle velocities of 150 m/s attributed to viscoelasticity. Oblique impact results show a pressure-dependence of yield strength for both polymers, up to maximum pressure "cap". Strain-rate dependent strengthening was also apparent when compared alongside low-rate data. Friction coefficients taken for polymer-aluminum tribo-pairs were found to be inversely proportional to pressure. Drucker-Prager yield surfaces were fit from data and implemented into CTH, with experiment-based Mie Gruneisen equations-of-state. The resulting simulations were able to adequately recreate the polymer response.

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