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The Taylor impact and high strain-rate response of poly(chlorotrifluoroethylene) PCTFE, poly(ether-etherketone) PEEK and Kel-F 800 PHILIP RAE, ERIC BROWN, GEORGE (RUSTY) GRAY III, Los Alamos National Laboratory, Los Alamos, NM 87545 — The mechanical properties of PCTFE, PEEK and Kel-F 800 have been investigated over a range of temperatures using both the Taylor impact geometry and Hopkinson bars. PCTFE and PEEK are both industrially important polymers. Kel-F 800 (comprising 75wt% PCTFE and 25wt% poly(vinylidene fluoride) PVDF) was a 3M product that is still used as a binder material in polymer bonded explosives. Compression and tensile Hopkinson bars have been used to generate stress vs. strain data over a range of temperatures for each polymer. Additionally, quasi-static tension and compression data has been collected with respect to strain-rate and temperature for comparison. The Taylor impact geometry has been used to study the ballistic response. High-speed photography was used to quantify sample deformation as a function of time. In each material, a transition velocity is identified between a ductile plastic response involving sample bulging and a brittle response initiated by cracking. Post-shot microscopy has been undertaken to elucidate failure mechanisms.

Philip Rae
Los Alamos National Laboratory

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