

Abstract Submitted
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Explosive particle image velocimetry in cast polydimethylsiloxane CHRISTOPHER TILGER, MICHAEL MURPHY, Los Alamos National Laboratory — Extrudable high explosive XTX 8004 was hand-loaded into custom-cast polydimethylsiloxane (PDMS) witness blocks in a cylindrical charge geometry. In the PDMS casting process a thin volume of polymer containing sparsely distributed tracer particles was added to allow direct observation of radial-drive velocities using ultra-high-speed explosive particle image velocimetry (ExPIV). The shock wave image framing technique (SWIFT), a laser-backlit derivative of focused shadowgraphy, simultaneously captured both detonation-front position along the HE charge length, as well as the temporal evolution of leading shock fronts propagating radially outward from the charge interface. The visualized axisymmetric and self-similar shock-front geometries were used to initialize a three-dimensional ray-tracing scheme that estimates the density-gradient-based optical distortion realized when observing the object plane through the curved shock fronts in PDMS. After applying a corrective mapping the particle positions were compared across images, which provided a field measurement of particle velocity throughout the shocked PDMS. Novel aspects of data analysis will be discussed, along with preliminary results quantifying XTX 8004 drive into PDMS witness media.

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