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Tracking Temperatures and Growth of Hot Spots in a Simplified Plastic-Bonded Explosive Under Shock Compression BELINDA P. JOHNSON, DANA D. DLOTT, University of Illinois at Urbana-Champaign — The relationship between microstructure and hotspot formation in high explosives (HE) is insufficiently understood at dimensions from 0.1-100s μm and during the first ns-μs after shock. To investigate the role of microstructure on hot spot formation and HE initiation we mass produce miniature samples comprised of a single HE crystal embedded in polymer matrices. With this simplified plastic-bonded explosive we can selectively probe microstructural features and defects such as grain boundaries, crystal inclusions, localized polymer-crystal delamination, crystal anisotropic shock response, etc. Via this versatile sample configuration, we also can tightly control the HE crystal environment either by adding additional HE crystals, selectively adding defects, and tuning the mechanical properties of the polymer. By using tabletop, laser-driven flyers, we shock sample targets and visually track hot spot formation/evolution using multi-frame fast photography with ns temporal resolution. Additionally, we measure the time dependent temperatures of these hot spots using a multichannel optical pyrometer coupled to a microscope objective that can resolve hotspots down to 2 μm.

Belinda Pacheco
University of Illinois at Urbana-Champaign

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