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Small-scale materials blast testing using gram-range explosives and air-shock loading MICHAEL HARGATHER, GARY SETTLES, Mechanical & Nuclear Engineering Dept., Penn State University — Many material properties are unknown under the high strain rates of shock wave impulse from an explosion in air. Actual blast testing is required for this, but full-scale explosive tests are expensive and dangerous, and yield limited data. Here we explore the possibility that gram-range explosive charges can be used for such testing in an ordinary laboratory setting. The explosion is characterized by high-speed digital shadowgraphy and piezoelectric pressure records of shock speed and overpressure duration. These data yield an explosive impulse describing the strength of shock loading at various stand-off distances from a material sample (typically 25cm diameter). Simultaneously, twin high-speed digital cameras and surface tracking software provide material displacement and strain rate data during the test. In principle, these data and the measured shock loading provide a means to find dynamic material properties by an inverse computational approach. A scaling analysis also relates the gram-range blast test to a large-scale blast from the same or a different explosive.

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