Abstract Submitted
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Thermal and mechanical responses of PBX 9501 under contact excitation under various driving intensities[1] J. MARES, J. MILLER, Purdue University, D. MOORE, Moore Shock Spectra, L. GROVEN, J. RHOADS, S. SON, Purdue University — The thermal and mechanical responses of a explosive (PBX 9501) and two non-energetic mock materials (900-21 and PBS 9501) under high-frequency mechanical excitation are presented with various driving intensities. Direct contact ultrasound transducers were used to excite samples through a frequency range of 50 kHz to 40 MHz. The mechanical response of each sample was approximated from a contact receiving transducer and trends were confirmed via laser Doppler vibrometry. The steady-state thermal response of the samples was measured at discrete excitation frequencies via infrared thermography. A maximum temperature rise of approximately 15 K was observed in PBX 9501, and the mock materials exhibited similar thermal characteristics. Temperature gradients were calculated to estimate the total heat generated within the samples due to the mechanical excitation. The active heating mechanisms were found to be highly dependent on the frequency of excitation. Possible mechanisms of heating at frequencies below 1 MHz are likely related to bulk motion. Above this frequency, the active heating mechanisms are likely related to particle-scale processes. The observed phenomena may prove useful in the aid of current trace vapor detection methods for explosives.

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Steven Son
Purdue University

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