Abstract Submitted for the SHOCK11 Meeting of The American Physical Society

Violent cookoff reactions in HMX-based explosives in DDT tubes: tracking luminous waves with streak imaging GARY PARKER, PETER DICKSON, BLAINE ASAY, LAURA SMILOWITZ, BRYAN HENSON, JOHN MCAFEE, Los Alamos National Laboratory — The authors present data from a series of high-temperature deflagration-to-detonation (DDT) tube experiments where the HMX-based high explosives PBX 9501 and LX-07 were heated above 180°C for various durations to impose damage (i.e. phase transitions and void generation) before being driven to cook off. These explosives have different polymeric binders, HMX mass fractions and cookoff responses and a comparison between the two offers revealing mechanistic insights on how thermal explosions evolve. From this series, results will be displayed indicating a wide range of violence from somewhat mild pressure bursts, to intermediate-power compressive burns, to high-violence DDT. Image data from high temperature DDT tube experiments, where the explosive was ignited on one end, were also collected and will be included for comparison. Analysis of the end-ignited streak images reveals characteristics that support established theories invoking a variety of burn modes in porous beds. Interestingly, from the cookoff experiments, the mechanism for build-up to DDT appears truncated. This analysis and its potential implications for modeling cookoff will be presented.

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