Abstract Submitted
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The effect of quasi-static mechanical pre-load on deflagration violence in PBX 9501 MATTHEW HOLMES, GARY PARKER, ROBERT BROILO, ERIC HEATWOLE, TREVOR FEAGIN, PETER SCHULZE, Los Alamos National Laboratory — Sufficient localization of heat will lead to a nascent ignition hotspot in PBX 9501, and the ensuing post-ignition response may vary from extinguishment to detonation. Confinement has long been implicated as an essential factor affecting post-ignition violence. We present an experiment in which confinement is controlled as an independent variable. A disc of PBX 9501 is sandwiched between sapphire anvils with a controlled quasi-static pre-load and center-ignited with an infrared laser pulse focused through the bottom anvil. The post-ignition response is observed to vary as a function of the quasi-static pre-load, ranging from quench to flame propagation down gas-driven cracks at velocities of ˜200 m/s. Above a threshold pre-load, pressure generated from product gases at the ignition site drives the formation and extension of radial cracks in the explosive. It is demonstrated that the dominant variable driving the early stages of deflagration violence is the gas confinement provided by a pressure seal formed by HE compression between the sapphire anvils. The results are placed within a context of drop/skid accident scenarios and place bounds on observed reaction violence of PBX 9501.

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