Abstract Submitted
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Initiation of pentaerythritol tetranitrate using a fast and high power plasma arc source[1] V. TANG, C.D. GRANT, J.M. ZAUG, J.F. MCCARRICK, H. WANG, E.A. GLASCOE, Lawrence Livermore National Laboratory — Initiation of high explosives (HE) is the process of transitioning the HE from a quiescent state to one containing a propagating release of chemical energy. Plasma arc initiation is driven by a discharge across the surface on or through the HE. Experiments have found that at least one conventional high explosive (pentaerythritol tetranitrate, PETN) can be arc-initiated with low threshold input energies. The underlying physics of these thresholds is not yet known. The ability to understand and predict plasma-based initiation is crucial for analyzing the safety of initiation systems. We are studying the high temperature plasma driven HE kinetics in these systems by using a plasma arc source that can deliver ∼200 mJ to the HE on the 10's ns time-scale. Here, we present both spatial and temporal characterization of the plasma temperature and density from this source via atomic emission spectroscopy. We also present preliminary kinetics results from time-resolved IR spectroscopic experiments of PETN films driven by these plasmas. Finally, we discuss simulations of these plasmas using a 1-D hydrodynamic model coupled with simple HE kinetics.

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