Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Laser-shocked energetic materials with metal additives: evaluation of detonation performance JENNIFER GOTTFRIED, ERIC BUKOWSKI, US Army Rsch Lab - Aberdeen — A focused, nanosecond-pulsed laser with sufficient energy to exceed the breakdown threshold of a material generates a laser-induced plasma with high peak temperatures, pressures, and shock velocities. Depending on the laser parameters and material properties, nanograms to micrograms of material is ablated, atomized, ionized and excited in the laser-induced plasma. The subsequent shock wave expansion into the air above the sample has been monitored using high-speed schlieren imaging in a recently developed technique, laser-induced air shock from energetic materials (LASEM) [1]. The estimated detonation velocities using LASEM agree well with published experimental values. A comparison of the measured shock velocities for various energetic materials including RDX, DNTF, and LLM-172 doped with Al or B to the detonation velocities predicted by CHEETAH for inert or active metal participation demonstrates that LASEM has potential for predicting the early time participation of metal additives in detonation events. The LASEM results show that reducing the amount of hydrogen present in B formulations increases the resulting detonation velocities. [1] J.L. Gottfried, Propellants Explos. Pyrotech. 40, 674 (2015).

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Date submitted: 02 Nov 2015 Electronic form version 1.4