Abstract Submitted
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Time-resolved products observed from high pressure deflagrating energetic materials using femtosecond IR spectroscopy J.M. ZAUG, E.A. GLASCOE, J.C. CROWHURST, L.E. FRIED, M.R. ARMSTRONG, C.D. GRANT, Lawrence Livermore National Laboratory — What transient chemical species occur on the nanosecond to microsecond time-scale after an energetic material begins to deflagrate under Chapman-Jouguet conditions? What are the molecular lifetimes of transient species under similar conditions? Using ultrafast infrared spectroscopy to study the transient chemical phenomena of materials encapsulated in high-pressure diamond anvils cells (DACs), these and related questions can be addressed. Here we present a broadband time-resolved IR (TRIR) absorption technique applied to high-pressure deflagrating energetic materials. A 10 nanosecond laser pulse is introduced onto the surface of a high-pressure energetic material. After an induction period of approximately one microsecond the energetic material begins to deflagrate (1500+K) at subsonic velocities radially away from the laser ignited region. A mid-IR femtosecond laser pulse (pulse-gated, 2-10 micron tunable range) is transmitted through the deflagration front. The single-shot mid-IR absorbance is used to detect transient species. Our measurements provide a rigorous test of computational chemistry models.

J.M. Zaug
Lawrence Livemore National Laboratory

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