Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Toward a Role of Light Absorption in Initiation Chemistry of Shocked HMX single Crystals and Crystalline High Explosives[1] IGOR PLAKSIN, L. RODRIGUES, ADAI, Un of Coimbra — Question which mechanism is driving radiation-induced reactions, thermal or athermal becomes a subject of conflicting discussions. Major challenge of this work is to identify at micro- (sub-granular), meso- (grain level) and macro-scale roles of these two mechanisms in triggering initiation chemistry in HMX-based HEs. Four acceptor-patterns were tested at 20 GPa input pressure: single HMX crystal-in-water, HMX/water-slurry, PBX(HMX/HTPB) & inert PBX-simulant (HMX-particles replaced by crystalline sucrose). Scenario of reaction onset-localizations-dissipation was spatially resolved using Multi-Channel Optical Analyzer MCOA-UC (96 channels, 100um-spatial accuracy, 0.2ns-timeresolution, 450-850 nm-spectral range) through real-time panoramic recording emitted reaction light and shock field in standard optic monitor. Experiments reveal a dual nature of initiation chemistry: athermal and thermal. Single-crystal tests disclose origination of photo-induced reactions downstream of emitting reaction spot due to intensified radiation absorption in surface micro-defects. Poly-crystalline samples reveal cyclic reproducibility of radiation-induced thermal precursors in which radiation absorption causes thermal expansion/phase-changes of HMX-grains resulting in oscillating detonation.

[1]Work was supported by the Office of Naval Research under the ONR and ONR Global Grants N00014-12-1-0477 and N62909-12-1-7131 with Drs. Cliff Bedford and Shawn Thorne Program Managers

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Date submitted: 26 Feb 2013 Electronic form version 1.4