Abstract Submitted
for the SHOCK09 Meeting of
The American Physical Society

Radiation-induced Precursors in Crystalline Energetic Composites I. PLAKSIN, L. RODRIGUES, S. PLAKSIN, J. CAMPOS, R. MENDES, J. RIBEIRO, J. GOIS, ADAI, University of Coimbra — We present new experimental evidence that demonstrates the origination of precursors of the major reaction front at SDT in PBXs, based on the results of wedge tests of the HMX/Epoxy 77/23 (wt. %) and HMX/Water composites. The precursors were spatially resolved in the modified wedge tests performed with the Multi-Channel Optical Analyzer – MCOA by means of the simultaneous registration of the reaction radiance transmitting through the explosive bulk at the SDT and the stress field, which is induced by the reaction zone in the optical monitor. Experimental evidence, obtained at a wide variation of the HMX particle sizes (1.64 μm $<$ d50 $<$ 960 μm), point to the fact that the precursor is arisen as a result of the radiation heating due to the photon absorption, as the reaction radiation is scattered within the bulk of the crystalline explosive material. Within the precursor layer, thickness of which depends on both, temperature localization and radiation intensity in the major DRZ as well as on optical and kinetic properties (the photon absorption and further reactivity of the explosive particles), the explosive particles undergo thermal expansion, phase transformation and partial decomposition. Such a mechanism implies that the photo-excitation and energy localization due to radiation of the shock front play a crucial role in starting decomposition process.

Igor Plaksin
ADAI, University of Coimbra

Date submitted: 24 Feb 2009 Electronic form version 1.4