HOT SPOT GENERATION IN ENERGETIC MATERIALS BY APPLYING WEAK ENERGIES

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Hot spot generation in energetic materials is an important process to initiate the exothermic chemical reaction, but the details of the fundamental science behind this process is still less-known. Although the response of energetic materials to low velocity impact have been heavily studied with high speed imaging, the response to the IR and acoustic is still not known. A high-speed thermal imaging microscopy apparatus was constructed to observe hot spot generation by weak energies ($\sim$30 THz optical frequency or 20 kHz acoustic frequency), to develop the fundamental science needed to understand energy concentration mechanisms leading to hot spot generation. Inhomogeneous crystals with defects and polymer binders were used in the experiments, with weak energies it is possible to detect the hot spot generation without destruction and deflagration-to-detonation transitions. We have successfully recorded the hot spot grown in the 1,3,5-trinitroperhydro-1,3,5-triazine (RDX) crystal and polymer-bonded sugar simulant by applying Far-IR radiation ($\sim$30 THz) and acoustic sonication (20 kHz) respectively, and proceeded preliminary analysis to investigate the mechanism.