Abstract Submitted
for the SHOCK09 Meeting of
The American Physical Society

A Fast NIR emission spectrometer for examining explosive events: emission spectra of PETN explosions containing silver and aluminum SCOTT PIECUCH, JON KOCH, Marquette University, JIM LIGHTSTONE, JOEL CARNEY, Naval Surface Warfare Center - Indian Head Division
— A fast NIR spectrometer was constructed to make temporally and spectrally resolved emission measurements during post-detonation combustion of pure pentaerythritol tetranitrate (PETN) charges and PETN charges doped with 10% (by mass) Ag and Al microparticles. The post-detonation spectra are observed between 750 nm and 1500 nm at rates up to 46k-spectra/sec, and key features are identified. Immediately following break-out of the detonation, all measured spectra are highly structured due to atomic and molecular emission. This emission decays within the first 40 μs following break-out and is found to have lifetimes similar to that of emission from various species collected in the visible (390-600 nm) by a time-resolved streak spectrometer. For the particle-doped charges, broadband NIR emission signals can be used to determine time-resolved gray-body temperatures of the particles. At early time (0-40 μs after breakout) gray-body temperatures ranging from 3000 to 4500 K are measured, between 60 μs and 300 μs after breakout the particle temperature is found to cool significantly ranging from 1000 K to 1500 K. Complementary two-color pyrometry (800 and 1150 nm) temperature measurements are found to be in good agreement with early time data (0-25 μs).

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Date submitted: 13 Feb 2009 Electronic form version 1.4