

Abstract Submitted
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Emission spectroscopy of aluminum in post-detonation combustion JOHN WILKINSON, RICHARD LEE, JOEL CARNEY, Indian Head Division, NSWC — Emission spectroscopy measurements were performed on the fuel-rich explosive formulation PBX-N113 to determine the temperature and pressure in the post-detonation combustion plume. Specifically, the emission of aluminum was interrogated to determine the temperature and pressure of the atomic species in the debris field. Pressures in a detonation can exceed 100 kbar and temperatures can exceed 4000 K. Collisional broadening of gas phase atoms and molecules in this extreme environment causes the emission lines to be measurably broadened. In this paper, we discuss collision-broadened aluminum emission spectra. Atomic temperatures were measured by excited state population ratios (inferred from peak heights) for near-uv emission and compared to two-color pyrometry. Post detonation pressure was found by measuring the peak widths of atomic aluminum lines and comparing to those in a traditional, invasive, piezoelectric pressure gauge.

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