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Time-Resolved Optical Measurements of Detonation and Combustion Products JOEL CARNEY, JOHN WILKINSON, JAMES LIGHTSTONE, Indian Head Division, NSWC — This presentation exhibits our initial attempts at measuring detonation and combustion products using time-resolved absorption spectroscopy. Transient species in the post-detonation combustion environment of a fuel-rich explosive event include emissive and non-emissive products ranging in size from atomic to macroscopic. The time-resolved concentrations of emissive and non-emissive species relate to the overall efficiency of the detonation. Recently, our group has used streak-camera based time-resolved emission spectroscopy to directly measure the relative concentrations of emissive species in a detonation environment. To relate measured emission intensities to a total species concentration vs. time in the environment following a detonation, the ratio of emissive and non-emissive species need to be estimated. In this presentation, we compare concentrations of post-detonation combustion transient species (aluminum and aluminum monoxide) measured by time-resolved emission spectroscopy and time-resolved absorption spectroscopy. Pressed samples of PETN and aluminum are used as controlled, fuel-rich explosive mixtures. The absorption measurements are directly proportional to the transient concentration and serve to scale the relative emission measurement to the total (emissive + non-emissive) concentration.

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