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Investigating the evolution of the optical emission spectra of HMX with reaction regime OLIVIA J. MORLEY, DAVID M. WILLIAMSON, University of Cambridge — The optical emission of HMX was studied during the different reaction rates of burning, deflagration and detonation. For burning, the material was ignited by a butane flame in air at room temperature and atmospheric pressure leading to millisecond flares. A modified BAM impact test was used for deflagration, resulting in a 20 s impact-initiated partially confined reaction. Detonation was achieved with a column of HMX pressed to a density of 84 2 % TMD. PDV measurements allowed the CJ-pressure to be calculated at 24.0 0.5 GPa, and the front velocity was measured at 7.8 0.3 km/s. Burning showed the main spectral emission to be from alkali metal impurities, with the 589 nm sodium peak dominating the spectrum. With the higher reaction temperatures and pressures of deflagration, the redshift and broadening of this spectral peak were measured, along with the competing blackbody emission. From the spectra, temperatures of 4000 K to 5000 K in deflagration and 7000 K in detonation were calculated. This temperature increase is likely caused by the higher pressure shock at the start of the detonation front adiabatically compressing interstitial gases to greater temperatures than achievable with the chemical reaction alone.

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