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A quantitative analysis of the chemical evolution of an iodine plume using optical filtering, imaging spectroscopy, and schlieren imaging[1] SARA DIGREGORIO, ALEXANDRA RIVERA, MICHAEL HARGATHER, New Mexico Tech — The chemical evolution of an iodine plume was quantitatively analyzed using a dual high-speed camera imaging system and verified using imaging spectroscopy. The dual high-speed camera imaging system consisted of a single parallel light lens schlieren system with a beamsplitter located after the knife-edge to send the light into two Photron Mini AX cameras. Each camera imaged through an optical notch filter, one at 520 nm and one at 650 nm. The 520 nm and 650 nm filters correspond to the maximum absorption wavelength and zero absorption wavelength of the iodine absorption spectra, respectively. A turbulent plume, consisting of vaporized iodine and a carrier gas, was imaged in the dual camera system. The resulting image sets were processed to relate differences in pixel intensity to light absorption intensity of the developing plume. The plumes iodine concentration was then derived from the changes in absorption intensity. A validation system, using a Horiba MicroHR imaging spectrometer and a Photron SA-X2 camera, measured the iodine plumes absorption spectra directly and verified the accuracy of the optical filtering technique. Results show the ability to perform simultaneous refractive imaging and species identification in a turbulent flow field.

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