

Combined LII and LIF with multiple excitation wavelengths for diagnostics of soot and PAH in laminar flames

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Through the use of two complimentary laser techniques, laser induced incandescence and laser induced fluorescence, the formation of soot from polycyclic aromatic hydrocarbons (PAH) has been studied. Information on soot volume fraction (from signal peak intensity) and particle cooling rate (from the signal decay time) is obtained from incandescence signal, while fluorescence measurements offer information on PAH present. These techniques were used to study a premixed flat flame of ethylene and air at a range of equivalence ratios. This project involves the use of three different excitation wavelengths (1064 nm, 532 nm, 290 nm). The fluences were adjusted so that the soot particles are heated to the same temperature by each excitation wavelength, resulting in equal incandescence intensity. Since no fluorescence is detected for 1064 nm excitation the contributions from incandescence and fluorescence can be separated. This is achieved by subtracting any signal obtained for 1064 nm excitation from the signals obtained for excitation at shorter wavelengths, leaving the remaining signal to be attributed to fluorescence. A monochromator has been used to resolve the signals, thus generating a time-sequence of emission spectra. This approach is helpful in identifying the contributions of LII and LIF to the signals detected.