

Chemiluminescence Measurements of Local Equivalence Ratio in a Partially Premixed Flame

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Abstract

Spatially resolved, time-averaged, multipoint measurements of flame emission spectra using two Cassegrain mirrors and two spectrometers are performed and the results are used to obtain the correlation of the intensity ratio of OH^*/CH^* and C_2^*/OH^* to the equivalence ratio in the laminar flames over an equivalence ratio range of 0.8-1.4. Results show that a strong correlation exists between the intensity ratio and equivalence ratio. The calibration equations obtained from the laminar flame measurements are then applied to obtain the local equivalence ratio in a partially premixed swirling flame. Experimental results demonstrate that multipoint measurement of local equivalence ratio in the partially premixed swirling methane flames is feasible. However, this non-laser based chemiluminescence technique can only be applied to determine the local flame stoichiometry in the reaction zone of the flames. Further improvement of the measurement system and possibility of simultaneous measurements of equivalence ratio and temperature are discussed.

Keyword : Chemiluminescence, Equivalence ratio, Multipoint measurement,
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