

Development of Point- and Plano Chemiluminescence diagnostics for
Hydrocarbon Flames

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Abstract

The objective of this research is to develop a low cost, nonlaser-based optical diagnostics for simultaneous measurements of local equivalence ratio and temperature in hydrocarbon flames. Generally, point-wise and planar measurements can be applied in Chemiluminescence diagnostics. The point measurement system consists of Cassegrain optics coupled with an optical fiber and a monochromator. The developed optical system is calibrated in premixed CH₄-air flames operated at several equivalence ratios ranging from 0.85 and 1.5. Experimental results indicate that the Chemiluminescence system can simultaneously measure the local equivalence ratio and temperature in hydrocarbon flames with reasonable accuracy. Furthermore, by integrating narrowband filters and an ICCD camera plano-measurements can be performed. Planar Chemiluminescence can provide non-intrusive and real time planar information for flame structure realization. Deconvolution image processing is performed to solve the light-integrating problem and resultant flame structural images are demonstrated.

Keyword : Planar Chemiluminescence, flame structure, Deconvolution image processing