

Development of Chemiluminescence Sensor for Combustion Measurements

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Abstract

The objective of this research is to develop a low cost, non-laser based optical sensor for measurements of local equivalence ratio in turbulent premixed hydrocarbon flames. The ultimate goal is the application of the developed sensor in industrial furnaces for monitoring combustion process. The measurement system consists of a Cassegrain optics coupled with an optical fiber and a spectroscopic unit. This paper reports the performance of the developed optical sensor by measuring the chemiluminescence emissions of OH^* , CH^* , and C_2^* in laminar premixed methane-air jet flames operated at several equivalence ratios ranging from 0.85 to 2.0. Experimental results indicate that this non-laser based chemiluminescence sensor can accurately measure the radial distributions of OH^* , CH^* , and C_2^* . The ability of using the intensity ratio of C_2^*/OH^* , C_2^*/CH^* , and CH^*/OH^* obtained in laminar flames to measure local equivalence ratio in turbulent flames is discussed.

Keyword : Optical sensor, Cassegrain mirror, Premixed flame, Chemiluminescence