

Soot Volume Fraction Experimental Data from Ethylene-Hydrogen and LPG Nonpremixed Flames Stabilized on a Bluff Body Burner

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Summary

This document provides a brief description of the soot data collected. Soot volume fraction was measured using the Laser-induced incandescence technique at various axial heights about the bluff-body. The bluff-body burner dimensions are $B=50$ mm

and a concentric jet diameter (D_j)= 150 mm

FLAME CONDITIONS

					Coflow Velocity (m/s)
Flame A	Ethylene: 1.000 Hydrogen: 0.000	74.2	30900	41.7	23
Flame B	Ethylene: 0.671 Hydrogen: 0.329	102.1	30800	41.9	23
Flame C	Ethylene: 0.487 Hydrogen: 0.513	130.7	30440	42.6	23
Flame D	LPG: 1.000	36.3	30474	32.0	23

Fuel Composition:

Ethylene – 99.0% purity
Hydrogen – 99.0% purity
LPG (molar)– 97.35% propane, 1.35% ethane, 1.20% butane, 0.07% nitrogen, and 0.03% carbon dioxide.

MEASUREMENT TECHNIQUE

Laser Induced Incandescence, LII:

A full description of the measurement technique has been presented in a previous publication Qamar et al. 2009. Briefly, the output of an Nd: YAG laser at 1064 nm was used for the LII excitation. The laser beam was shaped into a sheet with a vertical height of ~80 mm and a thickness of ~0.3 mm in the measurement region. The LII operating fluence was maintained at ~0.9 J/cm² throughout the experiment to ensure that the LII signal observed is independent of laser fluence variation.

The LII signal was detected through a 430 nm optical filter onto an intensified CCD (ICCD) camera. The gate width of the camera was set to ~40 ns and the timing was set to be prompt with respect to the LII excitation process. The LII signal was calibrated via laser beam extinction measurements.