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Radiation Measurements and Data Analysis of Turbulent Premixed Lean Flame

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ABSTRACT

An accurate understanding of the radiation transfer in turbulent premixed lean flame is critical for improving energy efficiencies and reducing emissions such as nitric oxide and soot. Radiation measurement is an effective and nonintrusive way to study the radiation properties of turbulent premixed lean flames. In this study, a high-speed infrared camera was utilized to measure the planar radiation from turbulent premixed lean flames under different conditions. Time-dependent flame images were acquired and radiation statistics were calculated and compared to investigate the effects of equivalence ratio, heat release rate, hydrogen pilot flame rate, and co-flow rate on the radiation intensity of the flames. Results show that radiation intensity increases with equivalence ratio and heat release rate. However, changes of hydrogen pilot flame rate and co-flow rate have little impact on the radiation intensity. These experimental data are essential for the study of turbulent premixed lean flames and the calibration of the empirical relations in the simulation models.

KEYWORDS

Turbulent premixed lean flame, radiation measurements, quantitative imaging

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