Optical Laser Diagnostics and Chemical Kinetics Investigation of Laminar Flame Speed for Hydrous Ethanol

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Abstract

Recently, the advance of computational fluid dynamics simulation applied on design of internal combustion engines (ICE) has highlighted the need of reliable chemical kinetics models for most common fuels applied on ICE operation, such as ethanol, gasoline and blends. Therefore, the mainly motivation for this study is determine and evaluate the influence of the water content on ethanol flames for laminar flame speed and chemical kinetics. For this goal, laminar flame speed measurements by OH-Emission and OH-PLIF were conducted on anhydrous and hydrous ethanol premixed flames at atmospheric pressure. Distinct fuel samples were evaluated at several equivalence ratios. Chemical kinetic simulation considering Marinov´s mechanism was performed in order to match velocities obtained from experimental data versus values obtained through numerical simulation, and to verify the characteristics of hydroxyl production at conditions studied. A sensitivity analysis for defined species was performed for the test conditions and the images obtained by laser techniques were correlated to simulated cases.

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Topic

- Computational fluid dynamics
- Ethanol
- Pressure