Interaction behavior between two laminar slot jet H_2/CO flames

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Hydrogen offers a unique opportunity in achieving a CO2-neutral future, however, due to the great component variation and safety issues of H2 energy, great challenges exist for the successful transition from conventional fossil fuels to H2. The multiple-injection combustor is a very flexible and efficient way to utilize H2 energy, and flame interaction in terms of heat and mass transfer plays an essential role in the performances of multiple-injection combustors. This work focused on the flame interaction behavior of two identical slot jet H2/CO diffusion flames, to provide some fundamental guidelines for the development of an H2 energy-fueled multiple-injection combustor. The effects of burner separating distance, fuel composition, and fuel velocity were parametrically studied. Results showed that flame interaction leads to a more uniform temperature distribution. Increasing H2 concentration decreases the flame length for the merged flame, but this effect is less distinguished for the merging and separated flames. Besides, increasing H2 content causes easier flame interaction because of the enhanced flame radius, a linear relationship was found between the merging distance and the H2 content; a more profound influence of fuel flow rate on the flame interaction was observed for the fuel with a higher H2/CO ratio. Numerical results showed that NOx emissions from two interacting flames depend on not only the flame temperature but also the entrained O2 amount.

Biography: Dr. Huanhuan Xu is a postdoc at ITV RWTH Aachen University, working as a Humboldt fellow since August 2022. She received her Ph.D. from Harbin Institute of Technology in China in 2018, and joined Shandong University as an assistant professor in the same year. Her current research focuses on the flame characteristics of hydrocarbon fuels, laser diagnostics in combustion, and the clean combustion technology of carbon-neutral fuels. She has published 20 papers and 4 patents she applied for have been authorized. H-factor of her is 10 according to Google Scholar.

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