Quenching and recovering of a lean premixed disk shaped flame by a pulsating nitrogen diluted fuel jet

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1 Abstract

Quenching and recovering mechanisms of a lean premixed methane air disk shaped flame impinging with a pulsating methane fuel jet diluted by nitrogen have been investigated experimentally. The burner system consists from the 40mm nozzle burner and the 8mm diameter pulsating jet with the solid wall placed in line vertically. The fuel jet is driven by a loud speaker. The intensities of the jet is set up to 4.0m/s. Then, the pulsating frequency is 20Hz. The disk shaped flame is curved by the pulsating jet. When the jet penetrates the center of the disk shaped flame, the flame locally quenches there. The total strain which is the combined effects by mean flow divergence and flame curvature plays a key role for the local quenching start. However, the local quenching may not trigger to develop the whole flame extinction event. The local quenching hole is almost recovered by the edge flame propagation or to reignite unburnt gas. In this study, we elucidate the trigger of the local quenching and its recovery phenomena by using a laser tomographic images and a particle image velocimetry. The added fuel in the pulsating jet strongly improves the quenching condition. The fuel in the pulsating jet may mixed with unburnt premixed gas in the quenching region. Then, the vortex motion at the edge of quenching hole plays an important role for the mixing and heating of the reactive gas.

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