Stabilization of Turbulent Lifted Jet Diffusion Flames Using Repetitive Pulsed-Arc Discharges(102.07.28-102.08.02)

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Abstract

In the present study, the effects of repetitive pulsed-arc discharges on the stabilization characteristics of turbulent lifted propane jet diffusion flames are investigated through detailed experimental measurements. The investigations are conducted using non-intrusive diagnostics of shuttered laser Particle Image Velocimetry (PIV) and a High-speed digital camera to record the initiated flame kernel edges propagation sequences caused by pulsed-arc discharges to study the flame stabilization process. The results show that the averaged liftoff height is reduced significantly when applying high repetition rate of pulsed-arc discharges together with a low jet exit velocity, and the lifted jet flames in hysteresis region can even reattach to burner rim for the case of repetitive rate at 100 Hz. Furthermore, by analyzing the velocity streamlines and vorticity field profiles in the upstream of lifted flame base from PIV measurements, it is found that the turbulent vorticity intensity is significantly enhanced when pulsed-arc discharges are applied. Therefore, the probability of successful self-sustained flame kernel propagation is increased leading to enhanced flame stability.

Keyword：pulsed-arc discharges, ignition, flame stabilization, partially premixed flame