

عنوان مقاله:

Experimental Studies on Suppression of Combustion Instability with the Addition of Helium

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خلاصه مقاله:

When combustion instability occurs, fluctuation in the release of heat couples with oscillating pressure, while the sensitivity of flame to acoustic disturbance restricts the oscillation intensity. This paper investigates the efficacy of helium in suppressing combustion instability. The flame structure, its sensitivity to acoustic disturbance and the inhibition of oscillating pressure with the addition of helium were studied by means of open tests, external-excited and self-excited combustion instability experiments. First of all, the addition of helium made larger flame surface area, which shaped the distributed flame, and the heat was such released over a broader space. Then, the external-excited combustion instability experiments confirmed that adding helium to fuel could decrease the sensitivity of flame to acoustic disturbance. Finally, Helium was used in the case of self-excited combustion instability to further investigate its effectiveness on the oscillation suppression. Proper Orthogonal Decomposition (POD) and Dynamic Mode Decomposition (DMD) methods were used to study flame fluctuation intensity. The results showed that the amplitudes of oscillating pressure were greatly reduced by the added helium. For ۲۵۰Hz mode, adding helium with ۲۰% of fuel flow could significantly reduce the flame pulsation and reduce the pulsation pressure by more than half. However, for the ۱۶۰hz mode, more helium should be added to achieve better results. When the helium flow exceeded ۸۰% of fuel flow, the combustion instability could be converted to stable combustion.

کلمات کلیدی:

Combustion instability suppression, Fuel dilution, Flame fluctuation, POD, DMD

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