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Suppression of thermo-acoustic instability using air injection in horizontal Rijke tube

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Abstract

The thermo-acoustic instability arising out of coupling between the pressure fluctuation and the unsteady heat release, when grows sufficiently, is known to cause serious structural damage thereby reducing the life span of systems having combustor for example, jet engines, gas turbines and industrial burners. The present work involves experimental study of thermo-acoustic instabilities occurring in a Rijke tube and their suppression by means of diverting a very small fraction of the incoming air flow in the form of radial injection from the wall of the tube through micro jets. A horizontal quartz tube with pre-mixed burner is used as the test model of Rijke tube. The coefficient Rayleigh Index (*RI*) is estimated from simultaneous measurement of chemiluminescence using a PMT and pressure in the plane of burner head. Experiments were carried out at the equivalence ratio of $\Phi = 1$ for a range of the burner position inside the tube, velocity of micro jets, and total mass flow rate through the tube. The control technique of micro jets was found to completely suppress the thermo-acoustics in a range of jet velocity depending on the burner position and the total air mass flow rate. For complete suppression of the thermos-

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