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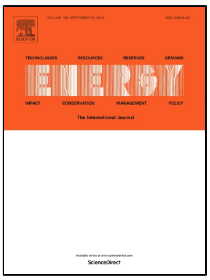

Experimental and theoretical study on flame front temperatures within ceiling jets from turbulent diffusion flames of n-heptane fuel

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Experimental and theoretical study on flame front temperatures within ceiling jets from turbulent diffusion flames of n-heptane fuel

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Abstract:

When an uncontrollable energy along with enormous pollutant emissions and high temperatures induced by a diffusion flame is released to a building, the ceiling-mounted thermal and smoke detectors are required to be actuated timely to achieve quick energy detecting, controlling and cooling. The information of ceiling flame length is important in estimating the energy release rate, radiative heat transfer from flames to surroundings and resulting safety distances of structures and people. In large scale confined spaces, the temperature measurement is provided as a feasible way to determine the ceiling flame length. This work aims to study how the heat release rate (HRR) influences the gas temperature at a given height below the ceiling representing the flame front. Two identical heptane pools were used as the fire sources and the pool size and edge spacing were varied to produce a wide range HRRs. The optimum flame front temperature was determined by comparing the results from the temperature measurement method and the video processing method. The experimental results showed that the characteristic flame temperature increases with increasing the HRR. A vertical temperature distribution model within ceiling jet was established to provide as a