Experimental measurements of the lift-off velocity and lift-off height, and numerical simulations were conducted of the liftoff and stabilization phenomena of laminar jet diffusion flames of inert-diluted C3H8 and CH4 fuels. Both non-reacting and reacting jets were investigated, including effects of multi-component diffusivities and heat release (buoyancy and gas expansion). The role of Schmidt number for non-reacting jets was investigated, with no conclusive Schmidt number criterion for liftoff previously known in similarity solutions. The cold-flow simulation for He-diluted CH4 fuel does not predict flame liftoff; however, adding heat release reaction leads to the prediction of liftoff, which is consistent with experimental observations. Including reaction was also found to improve liftoff height prediction for C3H8 flames, with the flame base location differing from that in the similarity solution - the intersection of the stoichiometric and iso-velocity contours is not necessary for flame stabilization (and thus lift-off). Possible mechanisms other than that proposed for similarity solution may better help to explain the stabilization and liftoff phenomena. The stretch rate at a wide range of isotherms near the base of the lifted tribrachial flame were also quantitatively plotted and analyzed.

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The public is welcome to attend.