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Bluff-body stabilized flame dynamics of lean premixed syngas combustion HONG G. IM, YU JEONG KIM, BOK JIK LEE, King Abdullah Univ of Sci & Tech (KAUST), KAUST TEAM — Recently, syngas combustion has been actively investigated for the potential application to integrated gasification combined cycle (IGCC) systems. While lean premixed combustion is attractive for both reduced emission and enhanced efficiency, flame instability becomes often an issue. Bluff-bodies have been adopted as effective flame holders for practical application of premixed flames. In the present study, high-fidelity direct numerical simulations are conducted to investigate the dynamics of lean premixed syngas flames stabilized on a bluff-body, in particular at the near blow-off regime of the flame. A two-dimensional domain of 4 mm height and 20 mm length with a flame holder of a 1 mm-by-1 mm square geometry is used. For a syngas mixture with the equivalence ratio of 0.5 and the CO:H₂ ratio of 1, several distinct flame modes are identified as the inflow velocity approaches to the blowoff limit. The sequences of extinction pathway and combustion characteristics are discussed.

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