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**Flame stabilization mechanisms in hydrogen enriched methane-air low-swirl flames** QIANG AN, National Research Council Canada, SINA KHEIRKHAH, University of British Columbia, JEFFREY BERGTHORSON, McGill University, SEAN YUN, National Research Council Canada, JEONGJAE HWANG, WON JUNE LEE, MIN KUK KIM, JU HYEONG CHO, HAN SEOK KIM, Korea Institute of Machinery and Materials, PATRIZIO VENA, National Research Council Canada — A newly designed low-swirl combustor by the Korea Institute of Machinery and Materials was tested for fully premixed $H_2$-$CH_4$/air reactant mixtures with equivalence ratios 0.6 to 0.9 and $H_2$ fractions 0% to 80%. Using simultaneous OH/$CH_2O$ planar laser induced fluorescence (PLIF) and stereoscopic particle image velocimetry (S-PIV), flame stabilization mechanisms and flame shape transitions were observed for three distinct flame shapes, namely lifted bowl-, lifted W-, and attached crown-shapes. The three flame shapes were stabilized through the dynamic balance between flame speed and flow velocity in the non-swirling, central flow region. Bowl-flames were generally shrouded by the inner shear layer, while the W- and crown-shaped flames involved flame segments reaching the outer shear layer of the flow, and were stabilized by shed eddies in the former and were hardware-stabilized in the latter. In the effective operating window of the burner, the flame could transition from one shape to another based on the equivalence ratio, $H_2$ fraction, and bulk flow velocity. The transition from W- to bowl-flames also led to an unusual internal blow-out zone within the global flame stability limits, where the existence of this zone was related to the laminar-flame extinction strain rate.

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