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Numerical investigations on combustion characteristics of H₂/air premixed combustion in a micro elliptical tube combustor

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Abstract: In this work, a micro elliptical tube combustor is developed and compared with the regular micro circular tube combustor. The objective of this work is to understand the combustion characteristics (pressure loss, wall temperature, emitter efficiency, heat loss efficiency and combustion efficiency) of H₂/air premixed combustion in micro elliptical tube combustors under various H₂ mass flow rates, H₂/air equivalence ratios and major/minor axis length ratios. Results show that the micro elliptical tube combustor owns higher emitter efficiency and combustion efficiency, while the micro elliptical tube combustor is faced with the challenge of the increase of the pressure loss and heat loss efficiency, compared with the micro circular tube combustor. Moreover, it is found that when the major/minor axis length ratio a/b and the H₂ mass flow rate is increased to 1.9/1.18 and 7×10^{-7} kg/s, respectively, the emitter power and emitter efficiency of the micro elliptical tube combustor is increased by 0.68W and 2.17%, respectively, compared with that of the micro circular tube combustor. This design extends the geometrical structure of micro tube combustors for applications in the MTPV system, providing us another way to develop micro

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