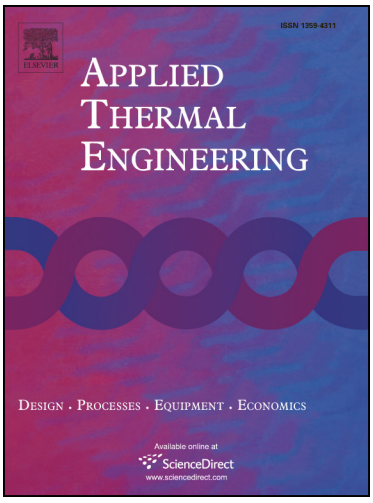

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Micro Combustion In A Porous Media For Thermophotovoltaic Power Generation

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Abstract

This work delved into porous media combustion (PMC) TPV with H_2/O_2 as fuel with much focus on experiment and numerical assessment of the TPV generator. The effects of some major parameters on PMC namely flow velocity, equivalence ratio and conductivity of the solid matrix were also numerically investigated.

The results indicated a reduction in combustion efficiency upon the increment in inlet velocity. It was as a result of reduction in the residence time. The average wall temperature decreased with increase in the solid matrix thermal conductivity. Increment in cell temperature decreased the forbidden band whiles the cut-off wavelength increased. Temperature variation of the PV cell also caused a 35% decline in output power of the system. For any 10 K increase in cell temperature, the cell efficiency and power output reduced by 7% and 0.14 W respectively. A projected electrical output power and power density of the complete system were 2.7 W and 0.72 Wcm^{-2} respectively when the cell temperature is kept at 300 K and the spacing between the radiant wall and the PVC is 1 mm. The experiment produced 1.703 W electrical power which was in consonance with what was predicted with the model.

Keywords: Thermophotovoltaic system; Power density; Porous media; Numerical simulation; Micro-combustion.