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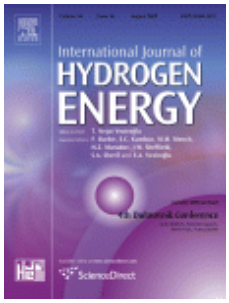

Micro methanol reformer combined with a catalytic combustor (Isolite CG) for a PEM fuel cell

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Abstract

This paper presents the development of a micro methanol reformer for portable fuel cell applications. The micro reformer consists of a methanol steam reforming reactor, catalytic combustor, and heat exchanger in-between. Cu/ZnO was selected as a catalyst for a methanol steam reforming and Pt for a catalytic combustion of hydrogen with air. Porous ceramic material was used as a catalyst support due to the large surface area and thermal stability. Photosensitive glass wafer was selected as a structural material because of its thermal and chemical stabilities. Performance of the reformer was measured at various test conditions and the results showed a good agreement with the three-dimensional analysis of the reacting flow. Considering the energy balance of the reformer/combustor model, the off-gas of fuel cell can be recycled as a feed of the combustor. The catalytic combustor generated the sufficient amount of heat to sustain the steam reforming of methanol. The conversion of methanol was 95.7% and the hydrogen flow of 53.7 ml/min was produced including 1.24% carbon monoxide. The generated hydrogen was the sufficient amount to operate 4.5 W polymer electrolyte membrane fuel cells.