

Novel micro-channel methane reformer combined with a hydrogen combustor

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A metal catalyst-containing, 80-ml, micro-channel reactor (MCR) with a section dedicated to combustion reaction was investigated for the potential application of on-board methane steam reforming (MSR) to hydrogen production. The metal catalyst was introduced into the MCR as a shape of a thin plate that was diffusion bonded with the other micro-channel plates. The combustion reaction was performed on the other side of the MCR for direct provision of the necessary heat for the endothermic MSR and for miniaturizing the system volume. In the MCR, both the methane conversion and the hydrogen production rate were extremely high compared with those of the equilibrium under atmospheric pressure. The required heat of reaction was successfully provided by the combustion of hydrogen on the other side of the MCR without the need for any heating cartridges.