Enhanced Water Management of High-Surface-Density Ni Foam as Flow Field for PEM Fuel Cells

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Ni foam with high surface density, has been proposed as an alternative flow field for PEM fuel cells, owing to large contact area, enhanced electron transport and low ohmic loss. The effect of pore diameter of Ni foam with high surface density above $1500 \text{ g} \cdot \text{m}^{-2}$ on physical parameters and cell performances was studied by polarization curves and EIS. Higher porosity, larger width of rib and higher flow field volume were obtained with pore diameter increasing. However, the cell performances of Ni foam were restricted, while larger R_{Ω} and R_{ct} was depicted because of lower internal surface area. The water management Ni foam with optimal pore diameter of $450 \text{ }\mu\text{m}$ was studied at flood, moderate and dry state, respectively. As humidity temperature increasing from 20 to 50°C , the power density increased, even at extremely flooding state. High-surface-density Ni foam behaved excellent mass transfer properties for reactant gas and liquid water in water management of PEM fuel cells.

Keywords: Ni foam, Surface density, Pore diameter, Water management

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