

Mathematical Modeling of SOFC for Internal Reforming of Methane with Carbon Dioxide

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The internal reforming of CH₄ with CO₂ over the single cell (NiO-YSZ-CeO₂/YSZ/(La,Sr) MnO₃) of SOFC system was carried out for the production of synthesis gases and electricity simultaneously, and suggested the mathematical method of a planar solid oxide fuel cell (SOFC) with the internal reforming. A single cell using the modified NiO-YSZ anode catalyst for internal reforming of CH₄ with CO₂ was prepared by tape casting and screen printing methods. The reaction rates of CO₂ and CH₄ and electrical properties were investigated by on-line GC and impedance analyzer under open- and closed-circuit, respectively. After the mathematical model of a planar SOFC predicting the performance was described accounting for the electrochemical and thermodynamic aspects, simulation results using the commercial computer code are shown. To confirm the accuracy of the model, experimental data with single cell is compared with the simulation results. The response of the cell voltage due to the change of cell design parameters is also considered.