

Validation and Sensitivity analysis of 1-D Dynamic Model of Autothermal Diesel Reformer for SOFC-APU (Solid Oxide Fuel Cell - Auxiliary Power Unit) system

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In SOFC-APU (Solid oxide fuel cell - auxiliary power unit) for heavy duty vehicle, the role of reformer is converting fuel to syngas and supplying syngas to SOFC. Outlet temperature and concentration of reformat gas directly affect the performance of SOFC, but we cannot check or measure states inside the reformer in reality. This leads us to establish a mathematical model that well describes the system with information we obtain from the experiment; temperature and concentration for both inlet and outlet. To model 1kW-scale autothermal catalytic diesel reformer, we developed a model based on the kinetic model, which is established from microreactor experiment and parameter estimation. We chose 1-D heterogeneous dynamic model to describe the system, because of the purpose of mobile application, needs for real-time measurement, and control issue. In this study, we validate simulation with various experimental data and perform sensitivity analysis to see which variable affects the outlet.