Dynamic modeling, simulation, and analysis for steam methane reforming

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This study developed the rigorous model for reformer which consists 2D-1D multiscale reactor, 2D wall, and 1D furnace models. The reformer model was validated based on comparison between the simulation results and reference data in term of temperature, mole fraction, pressure, and average heat flux from furnace side, and the good agreement was achieved. The sensitivity analysis for catalyst parameters in term of catalyst porosity and particle diameter and operation conditions in term of inlet gas flow rate, temperature, S/C ratio, and fuel flow rate was carried out. The analysis results showed potential of the multiscale reactor model for detail and reality prediction and important effect of the inlet gas flow rate, temperature, S/C ratio of reactor side and the inlet fuel flow rate of furnace side to reforming process. Therefore, these results can be used to combine with deep learning to apply for online using in industry, process design and optimization of hydrogen production.