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NUMERICAL SIMULATIONS OF THREE-DIMENSIONAL FLUID FLOW AND COUPLED HEAT TRANSFER IN BIPOLAR PLATES

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ABSTRACT

Bipolar plate is one of the key components in PEM electrolysis cell stacks, and it performs a number of essential functions in stack operation, such as reactant supply to the cell active area, current collection, and mechanical support to the MEA. High efficient PEM electrolysis cell stacks will require optimized bipolar plates. Improvements in the design of bipolar plates can help achieve the set goals of cost and performance for the PEM electrolysis cell. In the present work, numerical simulations were performed for three-dimensional fluid flow and coupled heat transfer in bipolar plates. The Reynolds number of inlet flow is varied from 100 to 900 on the anode side while the Reynolds number is maintained as a constant of 100. The solid wall surfaces of the bipolar plates are assumed to be adiabatically insulated, except that the active areas of the channels are supplied with uniform heat flux. Results of velocity and temperature distributions for different Reynolds numbers will be presented and discussed.