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Numerical Study for Improving Performance of Air Cooled Proton Exchange Membrane Fuel Cell on the Cathode Channel

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Abstract : In this study, we present the effects of bipolar plate design to control the temperature of the cell and ensure effective water management under an excessive amount of air flow and low humidification conditions in the proton exchange membrane fuel cell (PEMFC). The PEMFC model developed and applied to consider a three type of bipolar plate that is defined by ratio of inlet channel width to outlet channel width. Simulation results show that the design which has narrow gas inlet channel and wide gas outlet channel width (wide coolant inlet channel and narrow coolant outlet channel width) make the relative humidity and water concentration increase in the channel and the catalyst layer. Therefore, this study clearly demonstrates that the dehydration phenomenon can be decreased by using design of bipolar plate with narrow gas inlet channel and wide gas outlet channel width (wide coolant inlet channel and narrow coolant outlet channel width).

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