A Study on the Optimization of a PEM Fuel Cell with Open Cathodes

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ABSTRACT

In a PEM fuel cell stack with open cathodes air is forced to go through its cathode sides by an axial-fan, in which the air has a two-fold effect----being both a reactant gas and a coolant. This type of fuel cell system has a lot of merits, such as simple structure, compactness, and light-weight. So, they can be used as the power sources of small vehicles, such as electric wheel-chairs, scooters, and bikes. For a PEM fuel cell stack with open cathodes, the performance of the fuel cell depends on the quality of its membrane electrode assembly. Furthermore, the air channel size and air flow speed on the cathode side have substantial effect on the temperature and performance of the stack. The present thesis focuses on this type of fuel cell stack. The temperature distribution and performance of the fuel cell under various channel designs and air flow speeds were investigated by numerical simulations using the commercial code COMSOL MULTIPHYSICS.

Keywords : PEM ; fuel cell ; Numerical simulation

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