3-Dimensional CFD Simulation Modeling for Optimal Flow Field Design of Polymer Electrolyte Membrane Fuel Cell Bipolar Plate

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A rigorous CFD model is developed for efficient design of the polymer electrolyte membrane fuel cell (PEMFC). It is important to predict water crossover and to find poerating stategies that can reduce water crossover, so as to improve the system efficiency. To reduce experimental costs, development of the high accuracy computational fluid dynamics (CFD) model for PEMFC is required.

This study focuses on a CFD model for modeling gas evolution and flow patterns in a PEMFC. The model is based on improved two-phases model with a new method for estimating the gas content without empirical mass transfer coefficients. New equations for the source term are derived using the equilibrium flash equation for multicomponent gas-liquid stream. The improved two-phase performance without empirical correlations. The flow geometry of the anode side has important implication on gas evolution. The developed CFD model is valuable in simulation of PEMFC with different flow fields.