Mass Transfer of Oxygen in Gas Diffusion Layers of PEM Fuel Cells

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ABSTRACT

A simple two-dimensional model pertaining to the kinetics and mass transfer in the cathode of a PEM fuel cell is presented. In this model, the catalyst layer was simplified as an infinite thin film, and Fick's law used to describe the mass transport of oxygen in gas diffusion layer was reduced to a pure diffusion equation by the introduction of an equivalent diffusivity of oxygen. The mass transfer of oxygen in the gas diffusion layer as well as the performance of PEM fuel cells under the influence of current collector ribs was investigated. The results show that, due to the existence of ribs, the gas diffusion layer is only partly used for the mass transfer process and its effectiveness decreases with cell current density and increases with the width of gas flow channels. In point of mass transfer, the thickness of gas diffusion layer should be as thin as possible if the porosity is low. However, when high-porosity gas diffusion layer is used, an optimal thickness ought to be determined to ensure high performance of the PEM fuel cells.

Keywords : PEMFC, Mass Transfer, Gas Diffusion Layer

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