عنوان مقاله:

Performance improvement of PEM fuel cells using air channel indentation; Part I: Mechanisms to enrich oxygen concentration in catalyst layer

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خلاصه مقاله:

A three dimensional, compressible, steady, one phase flow of reactant-product mixture in the air side electrode of proton exchange membrane fuel cell (PEMFC) is numerically studied in this paper. The mixture is composed of three species: oxygen, nitrogen and water vapor. The performance of the cell is enhanced by partial blockage of the flow field channels. Various types of these blocks also called as dents in this study are considered. Examples of the dent profile shapes are: square (labeled as SQ case in this paper), semicircle (or SC) and trapezoid (or TR), and the enhancements are compared with that of no dent (or ND) case. It is observed that channel indentation can enhance the content of oxygen concentration at the face of catalyst layer up to 18%. It is noted that the content of oxygen at the face of catalyst is the driving moment for the kinetics of reaction within the catalyst layer. Hence channel indentation can be considered as a proper mechanism to enhance the performance of fuel cells. In this paper only the increasing of driving moment is discussed and the analysis of net power enhancement will be discussed later in another paper.

کلمات کلیدی:

PEM Fuel Cell,CFD,Channel Indentation,Performance Enhancement,