Investigation on the sufficiency and uniformity of channel-porous layer flow in PEM fuel cells

Weitong Pan¹, Xueli Chen¹, Fuchen Wang², and Gance Dai²

¹East China University of Science and Technology

²Affiliation not available

November 14, 2021

Abstract

Acting as the reactant distributor, the gas channel (GC)-gas diffusion layer (GDL) assembly is of significance to the PEM fuel cell performance and durability. In this work, an analytical flow model has been developed for the GC-GDL system. Based on the explicit expressions of the channel-porous layer flow structure, the effects of geometrical parameters are clarified and the flow effects including reactant conversion and uniformity are further derived and clarified. Results reveal that with thinner GDL or longer GC, the nonlinear decrease of axial velocity becomes faster and the decrease of transverse velocity turns from linear to nonlinear. Furthermore, the reactant conversion and uniformity are in an opposite relationship and the criterion of flow homogenization in the fuel cells is proposed to make a trade-off. Moreover, the flow non-uniformity is positively correlated with GC length, which gains insights into the fuel cell scale-up.

Hosted file

Manuscript.docx available at <https://authorea.com/users/446115/articles/545443-investigation-on-the-sufficiency-and-uniformity-of-channel-porous-layer-flow-in-pem-fuel-cells>