World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:13, No:01, 2019

An Investigation of a Three-Dimensional Constitutive Model of Gas Diffusion Layers in Polymer Electrolyte Membrane Fuel Cells

Authors : Yanqin Chen, Chao Jiang, Chongdu Cho

Abstract : This research presents the three-dimensional mechanical characteristics of a commercial gas diffusion layer by experiment and simulation results. Although the mechanical performance of gas diffusion layers has attracted much attention, its reliability and accuracy are still a major challenge. With the help of simulation analysis methods, it is beneficial to the gas diffusion layer’s extensive commercial development and the overall stress analysis of proton electrolyte membrane fuel cells during its pre-production design period. Therefore, in this paper, a three-dimensional constitutive model of a commercial gas diffusion layer, including its material stiffness matrix parameters, is developed and coded, in the user-defined material model of a commercial finite element method software for simulation. Then, the model is validated by comparing experimental results as well as simulation outcomes. As a result, both the experimental data and simulation results show a good agreement with each other, with high accuracy.

Keywords : gas diffusion layer, proton electrolyte membrane fuel cell, stiffness matrix, three-dimensional mechanical characteristics, user-defined material model
Conference Title : ICHEFCT 2019 : International Conference on Hydrogen Energy and Fuel Cell Technology
Conference Location : Sydney, Australia
Conference Dates : January 30-31, 2019