World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:18, No:04, 2024

Dynamic Thermal Modelling of a PEMFC-Type Fuel Cell

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Abstract : In the context of the energy transition, fuel cell technology has emerged as a solution for harnessing hydrogen energy and mitigating greenhouse gas emissions. An in-depth study was conducted on a PEMFC-type fuel cell, with an initiation of an analysis of its operational principles and constituent components. Subsequently, the modelling of the fuel cell was undertaken using the Python programming language, encompassing both steady-state and transient regimes. In the case of the steady-state regime, the physical and electrochemical phenomena occurring within the fuel cell were modelled, with the assumption of uniform temperature throughout all cell compartments. Parametric identification was carried out, resulting in a remarkable mean error of only 1.62% when the model results were compared to experimental data documented in the literature. The dynamic model that was developed enabled the scrutiny of the fuel cell's response in terms of temperature and voltage under varying current conditions.

Keywords : fuel cell, modelling, dynamic, thermal model, PEMFC
Conference Title : ICHESE 2024 : International Conference on Hydrogen Energy Science and Engineering
Conference Location : Paris, France
Conference Dates : April 11-12, 2024

Open Science Index, Energy and Power Engineering Vol:18, No:04, 2024 publications.waset.org/abstracts/176646.pdf