

## A PEM Fuel Cell Model Based on Artificial Neural Network and Particle Swarm Optimization

Miguel Gonzalez<sup>1</sup>, Victor M. Sanchez<sup>1</sup>, F. Chan<sup>1</sup>, R. Barbosa<sup>1</sup>

<sup>1</sup>Universidad de Quintana Roo, Boulevard Bahía s/n, Chetumal, Q. Roo, México, 77019.  
Tel: +5298350300; e-mail: vicsan.huerta@gmail.com

---

### ABSTRACT

This paper presents a proton exchange membrane fuel cell (PEMFC) model obtained from a neural network trained by a particle swarm optimization algorithm (PSO). Although in the open literature there are several works using neural networks for PEMFC modeling, backpropagation or gradient training algorithms are used in them. PSO is a stochastic population-based search method which has been shown as powerful method for optimization global in several applications. In this work, neural network is employed for modeling the internal processes of the PEMFC such as the gas pressure, temperature, humidity in order to produce a response that fits to the real performance of the fuel cell. The results shown that the PEMFC model obtained by the neural network trained by PSO obtains the best response, outperforming traditional training algorithms for neural networks. The PEMFC model obtained can be used to research the influence of internal process variables for the optimal design of cells or stacks of PEMFC.

---

*Keywords:* fuel cells; neural-networks, particle swarm optimization.

