MATLAB Simulation of 500 W Direct Methanol Fuel Cell Stack

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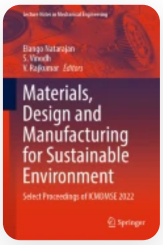

Materials, Design and Manufacturing for Sustainable Environment

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Abstract

This paper aims about the mathematical model analysis of 500 W direct methanol fuel cell (DMFC) using MATLAB SIMULINK. Three dynamic models, Input I-stdy-ideal, Input I-stdy, InputI-dynshrt4, were included with simulation time of

4900 ms, 3900 ms and 2040 ms, respectively. Ideal cell load with steady state, real fuel cell load with steady and real fuel cell load with transient state had been studied in detail. Pattern of output voltage, current density, power density and temperature distribution with respect to time has been found. Decreasing voltage pattern and increasing current density pattern are in line with typical VI (Voltage-Current density) curve. The optimum cell conditions obtained at 3100 ms are 25 V, 23 A/cm^2 which gives the maximum power density of 575 W/cm^2 at the operating temperature of 315 K. One of the major advantages of DMFC is obtaining maximum efficiency at the operating temperature which is closed to ambient conditions unlike proton exchange membrane fuel cell (PEMFC).