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The effect of different catalyst layer porosity on proton-exchange membrane fuel cells

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Nowadays, due to the development of relevant technology for renewable energy sources and the effects of global warming, it has increased considerably. Especially with the introduction of electric vehicles on the market, energy storage solutions are at the forefront. The use of batteries in this regard is quite popular, but it has not been able to solve various problems of battery technology (length of charging time, a risk of explosion, etc.). In this sense, the studies on the fuel cell technologies, which are supposed to produce and use the energy in place, have gained speed. The fuel cells are still in development. Proton Exchange Membrane Fuel Cells (PEMFC), which are especially low temperature fuel cells, are highly promising. In the study, the effect of the porosity of anode-side catalyst layers on the performance of proton exchange membrane fuel cells was modeled. In the prepared model, all geometric parameters and material properties except the catalyst layer porosity are kept constant. The catalyst porosity was maintained between 0.1 and 0.5 and a parametric study was carried out with variations of 0.1. Obtained from the current-voltage graphs, the catalyst layer ensures maximum performance over a certain range of porosity. The highest performance was observed in the fuel cell using a catalyst with a porosity value of 0.2. The low performance of the fuel cell using catalysts with porosity values of 0.5 and 0.1 revealed that this value should be limited. The results of the work done were compared with the models in the literature and the model was verified.

Biography

Anil Can Turkmen has completed his B.Sc. and M.Sc. at the age of 27 years from Kocaeli University and he worked in Lund University/Sweden, for 1 year. He has published more than 15 papers. He was working on modeling and experimental study about Proton Exchange Membrane Fuel Cells and Direct Borohydride Fuel Cells.

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