Modeling and Simulation of Direct Methanol Fuel Cell Using COMSOL

AbhishekKumar[1], Murali Mohan Seepana[1*]

[1]*Department of Chemical Engineering, National Institute of Technology Warangal, 506004, India*
**Corresponding Author: murali@nitw.ac.in*

Abstract

Direct methanol fuel cell (DMFC) is considered as the next generation of fuel cells since low temperature operation for DM fuel cells has several advantages. Direct methanol fuel cells (DMFC) could act as a replacement for batteries in low power electronics. The power output of a DMFC is limited by kinetics of both the methanol oxidation reaction (MOR) on the anode and the oxygen reduction reaction (ORR) on the cathode. Modeling can help to pre-estimate the effects of different design parameters and operating conditions on the fuel cell performance, which shortens the required time for these analysis in reference to the time spent for experiments. Three-dimensional (3-D) model of DMFC is developed using **COMSOL Multiphysics 5.3** assuming isothermal and steady-state process. Model domain is considered for geometry is single flow channel. Some critical parameters are prescribed as effective parameters for DMFC performance. The study was focused on the performance of DMFC with respective to the inlet velocity (flow rate) of reactant liquid to the anode, inlet liquid channel and conductivity of the membrane. Initially single channel DMFC model was considered for studying the influence of inlet velocity of reactant liquid and conductivity of the membrane on cell voltage. It was observed that DMFC performance is enhanced with increase in inlet velocity of methanol and proton conductivity of the membrane.