June 2016, MM424 Graduation Project Supervisor Dr. A. Biyikoglu

"3D FINITE VOLUME BASED CFD ANALYSIS OF SATURATION EFFECT OF PEM FUEL CELL"

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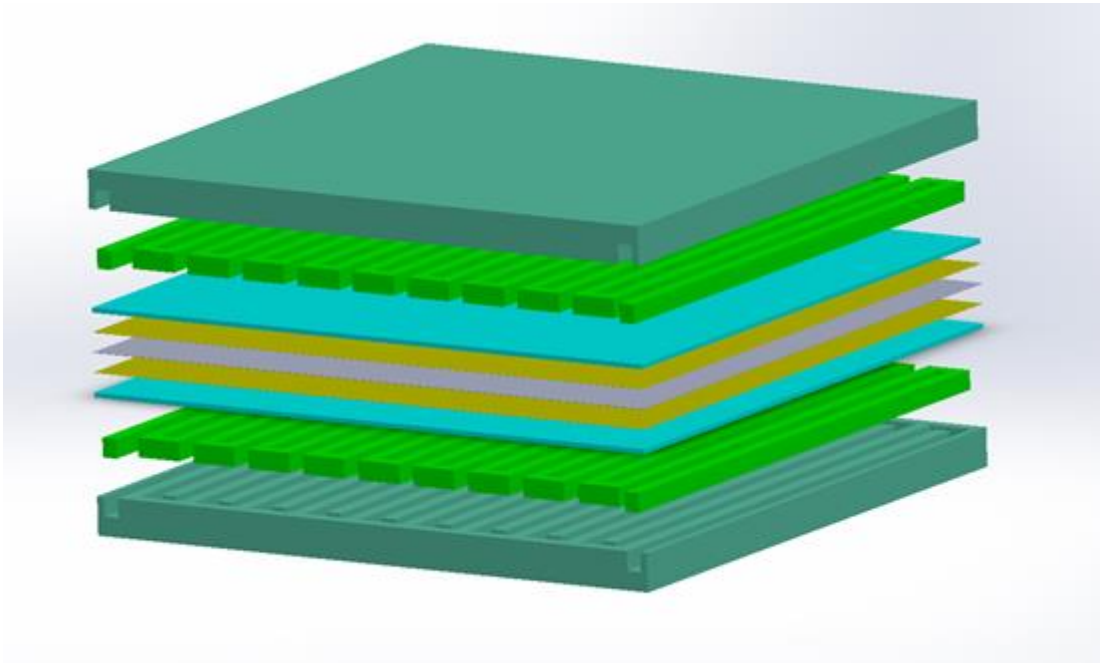
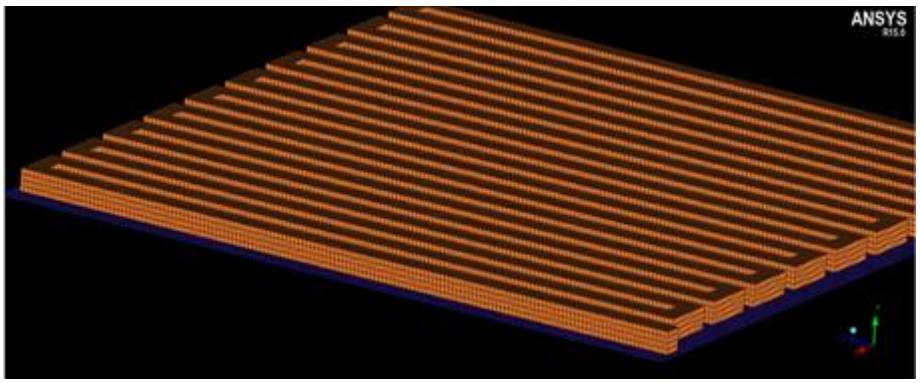
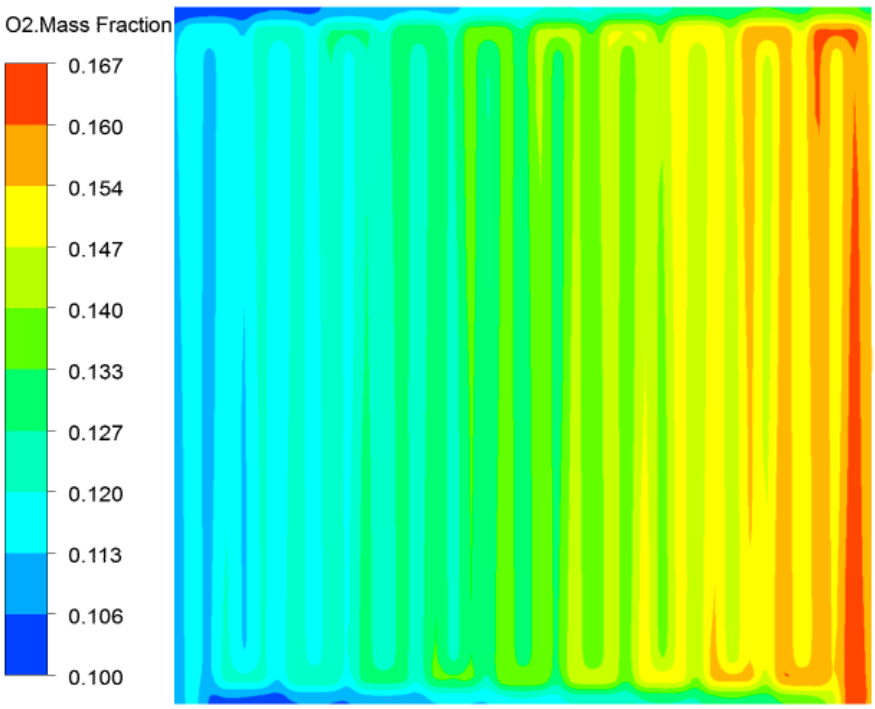
PEM fuel cells are promising energy convertors that have zero emission, are quiet and versatile. Condensation may occur in PEM fuel cells which are running at relatively low temperatures. After condensation, formed water droplets may block the cathode catalyst and gas diffusion layers. For this reason, oxygen may not diffuse through to reaction sites. Researches generally ignore the condensation when they are modelling PEM fuel cells. In this study, PEM fuel cells components and theory was given after that numerical analysis was done with FLUENT software. Following the validation of results, parametric study has been conducted via FLUENT PEMFC MODULE for the condensation effect. The module calculates the effect of saturation theoretically. Literature data is used for saturation exponent for pore blockage and contact angle. It can be concluded that, amount of oxygen not consumed due to water droplets, so condensation effect cannot be ignored considering the numerical analysis results of this study.






O2.Mass Fraction
0.167
0.160
0.154
0.147
0.140
0.133
0.127
0.120
0.113
0.106
0.100