The effect of GDL porosity on the performance of PEFCs

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A three-dimensional mathematical model for polymer electrolyte fuel cells was developed in order to analyze physical and electrochemical phenomena using Computational Fluid Dynamics (CFD) technique. The numerical model was validated against the experimental data of average polarization curve under 100% humidified conditions for 1.62/1.25 anode/cathode stoichiometry ratios. In this study, we mainly focus on performance of the fuel cell system in accordance with various GDL porosities: 0.2, 0.4, and 0.6. From the results, the performance of the fuel cell improves with the increase of cathode porosity more than anode porosity. Because gas-phase diffusivity increases with the increase of porosity, which decreases mass transport limitation of gas. And as gas-phase oxygen diffusivity is 4-5 times smaller than hydrogen, oxygen gas transport in cathode catalyst layer mainly affects the performance of the fuel cell than hydrogen.