## عنوان مقاله:

Numerical modeling and parametric study of a cathode catalyst layer in polymer electrolyte membrane fuel cells

## محل انتشار:

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## خلاصه مقاله:

This paper investigates the effect of structural parameters on the variation of activation overpotential. The structural parameters considered in this paper are: (i) platinum mass loading per unit area, mPt; (ii) carbon mass loading per unit area, mC; (iii) volume fraction of the Nafion® ionomer phase within the Cathode catalyst layer (CCL), Lm,c; (iv) volume fraction of the gas diffusion layer (GDL) material buckled into the CCL, Lg,c; and (v) the CCL thickness, lc. Minimization of the activation overpotential at a given cell current density is taken as a goal function in the present study. The results show that at higher cell current density oxygen consumes completely at the shorter thickness of catalyst layer from the CL/GDL interface. For all values of lc, as lc increases, the CL performance decreased. Also the results show that the Lm,c and mC are more effective on CL performance than other parameters. The optimum value for mPt, mC and Lm,c are 1.9 mg cm-2, 1.05 mg cm-2 and 42.5 Vol% respectively for lc=50 μm. In addition we considered that the activation overpotential is not more sensitive to the Lg,c at all catalyst layer thicknesses. Model predictions compare well with known experimental results [1]. The results give very helpful guidelines to the MEA and CL manufacturers.

## کلمات کلیدی:

PEM fuel cell, Catalyst layer, Parametric study