PtSn/C Electrocatalysts used as Cathodes and Anodes In a Single Direct Ethanol Fuel Cell

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In various applications, fuel cells are widely recognized as very attractive devices to obtain directly electric energy from the combustion of a chemical product. Low temperature fuel cells, generally conceived around a proton electrolyte membrane seem able to be used for a large range of power applications. Ethanol offers an attractive alternative as a fuel [1] in low temperature fuel cells rather than methanol because it can be produced in large quantities from agricultural products, it is the major renewable biofuel from the fermentation of biomass, and it has also higher mass energy density when compared to methanol. In this work, single direct ethanol fuel cells (DEFC) experiments were performed using three cells configuration (anode||cathode): a) PtSn (E-tek)||Pt (E-tek), b) PtSn (MPP – polymeric precursor method)||Pt(E-tek) and c) PtSn (MPP)||PtSn (MPP), being all the materials 20 % (w/w) on carbon and with PtSn mass ratio (3:1). The PtSn/C electrocatalysts (MPP) were prepared using the polymeric precursor method using carbon support [2,3] using (metal/citric acid/ethylene glycol (1:50:400)). For those configurations were used: T = 100 ^{o}C, nafion 117, with and without a pressurization of 0.2 MPa, ethanol 2 mol L^{-1}, and inlet ethanol flow = 2 ml min^{-1}. The catalytic performance for the three configurations studied was evaluated by using stationary polarization and power density curves in a single direct ethanol fuel cell. Using the configuration c) it was obtained a power density 35 % higher than the one for configuration a) without pressurization. With pressurization the power density of configurations a) and c) are almost the same. These results indicate that there is a higher tolerance on the crossover effect using the PtSn electrocatalysts prepared by the PPM in both sides of the single DEFC, it is suggested that this effect can be related to kinetics of oxygen reduction reaction. Based on the above results the PtSn electrocatalyst prepared using the polymeric precursor method used in the cathode and anode of the direct ethanol fuel cell provides a higher power density than the other commercial materials. The material prepared presents the highest tolerance to the crossover effect among the materials used.

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