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# PERFORMANCE OF A PASSIVE DIRECT ETHANOL FUEL CELL

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## Abstract

In the last years, ethanol emerged as an attractive fuel, for direct fuel cells, since it is much less toxic and has higher energy density than methanol and can be produced from biomass. Direct ethanol fuel cells (DEFCs) appear as a good choice for producing sustainable energy for portable applications. However, they are still far from attaining acceptable levels of power output, since their performance is affected by the slow electrochemical ethanol oxidation and water and ethanol crossover.

In the present work, an experimental study on the performance of a passive DEFC with 25 $cm^2$ of active area is described. Tailored MEAs (membrane electrode assembly) with different catalyst loadings, anode diffusion layers and membranes were tested in order to select optimal working conditions at high ethanol concentrations and low ethanol crossover. The performance increased with an increase of membrane and anode diffusion layer thicknesses and anode catalyst loading, mainly due to a decrease of the ethanol crossover.

In this work the maximum power density, 1.33 $mW/cm^2$, was obtained using a Nafion 117 membrane, 4 $mg/cm^2$ of Pt-Ru and 2 $mg/cm^2$ of Pt, as respectively, anode and cathode catalyst layers, ELAT as anode diffusion layer, carbon cloth as cathode diffusion layer and an ethanol concentration of 2 M. As far as the authors are aware this is the first work reporting an experimental optimization study on passive direct ethanol fuel cells.