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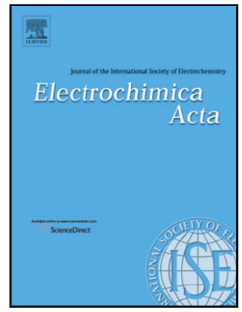


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# Electrochemical characterisation of a microfluidic reactor for cogeneration of chemicals and electricity

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## Abstract

A microfluidic fuel cell type reactor based on the co-laminar flow cell design has successfully been constructed. This reactor provides the advantages of electrosynthesis in terms of selectivity, but does not require electricity to operate as classical electrochemical reactors do and it is capable of generating a small amount of electricity instead. Due to the microfluidic design, no membrane is needed for this reactor cutting down the costs. The feasibility of this reactor is examined in this study, and it is characterised electrochemically using linear sweep voltammetry. As a case study for microfluidic cogeneration, the hydrogenation of nitrobenzene is chosen as this reaction provides many valuable products such as aniline and azoxybenzene. The methanol oxidation is taken as a counter reaction. The highest conversions were observed at the lowest flow rate and lowest concentration of nitrobenzene. As expected, the highest currents were observed at the highest concentration, but the flow rate did not have a high influence on the current, due to self-poisoning nature of the methanol oxidation, i.e., the surface was gradually covered with CO molecules. At a certain amount of CO coverage the anode was found capable of self-regeneration. The highest power density obtained was 0.542mW $cm^{-2}$ at a cell potential of 0.217V and a

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