

# Micro Direct Methanol Fuel Cell: Experimental and Modelling Studies

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## Abstract

The Direct Methanol Fuel Cell (DMFC) has attracted much attention due to its potential applications as a power source for transportation and portable electronic devices. Based on the advantages of the scaling laws, miniaturization promises higher efficiency and performance of power generating devices and the MicroDMFC is therefore an emergent technology.

In this work, a set of experiences with a MicroDMFC of 2.25 cm<sup>2</sup> active area are performed in order to investigate the effect of important operating parameters. The cell is presented in Fig. 1. The experimental rig consists in a rotameter for air flow, a peristaltic pump (Control CO) for methanol flow and an electrochemical station (Zahner) to obtain polarization curves. The effect of the methanol concentration on the cell performance, between 3 and 5 M was studied. All the experiments were performed at room temperature, a condition of special interest with view to portable applications.

Maximum power density achieved was 32.6 mW/cm<sup>2</sup> using a 4 M methanol concentration at room temperature. Polarization curves are compared with mathematical model simulations in order to achieve a better understanding of how parameters affect performance.

The one-dimensional model used in this work takes in account coupled heat and mass transfer, along with the electrochemical reactions occurring in a direct methanol fuel cell and was already developed and validated for DMFC in previous work [1-3]. The model is also used to predict some important parameters to analyze fuel cell performance, such as water transport coefficient and methanol crossover. This easy to implement simplified model is suitable for use in real-time MicroDMFC simulations.

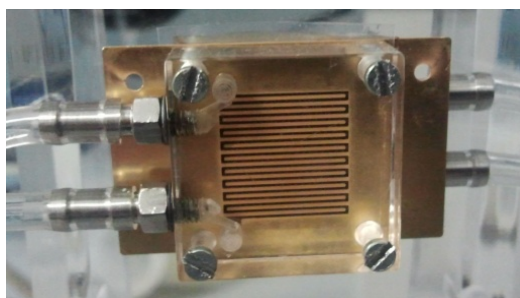


Fig. 1 Micro DMFC frontal view.

**Keywords:** MicroDMFC; Experimental Studies, Modelling, Heat and Mass Transfer

## Acknowledgements

The partial support of “Fundação para a Ciência e Tecnologia - Portugal” through project PTDC/EQU-FTT/112475/2009 and scholarship SFRH/BPD/76063/2011 is gratefully acknowledged.

## References

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