Electronic Supplementary Material (ESI) for ChemComm.

Supplementary Information

AuPd/Polyaniline as anode in an ethylene glycol microfluidic fuel cell operated at room temperature

Noé Arjona,[a] Alexander Palacios,[b] Alonso Moreno-Zuria[a], Minerva Guerra-Balcázar,*[b] Janet Ledesma-García[b] and Luis Gerardo Arriaga**[a]

a Centro de Investigación y Desarrollo Tecnológico en Electroquímica, 76703, Querétaro, México.

b División de Investigación y Posgrado, Facultad de Ingenie-ría, Universidad Autónoma de Querétaro, 76010 Querétaro México.

** larriaga@cideteq.mx

* minbalca@yahoo.com.mx

The electrocatalytic activity toward ethylene glycol tested on Au/polyaniline, Pd/polyaniline and AuPd/polyaniline is presented in Figure S1. On Pd/polyaniline a small peak related to the ethylene glycol oxidation is observed at 0.92 V *vs*. RHE. For Au/polyaniline a well-defined peak is located at 1.2 V *vs*. RHE. The effect of the Au-Pd mixture influenced the onset potential for ethylene glycol oxidation on AuPd/polyaniline electrocatalyst, which showed a negative shift ca. 300 mV compared to AuPd/C.

The effect of polyaniline as support in the AuPd/polyaniline array was compared to AuPd synthetized on a glassy carbon electrode keeping the same metal composition (Fig. S1). The AuPd/polyaniline shows a more negative potential than that obtained with AuPd/C, which could be related with an enhancement of the metal-support interaction. The data obtained with Au-based materials were normalized by the Au loading.

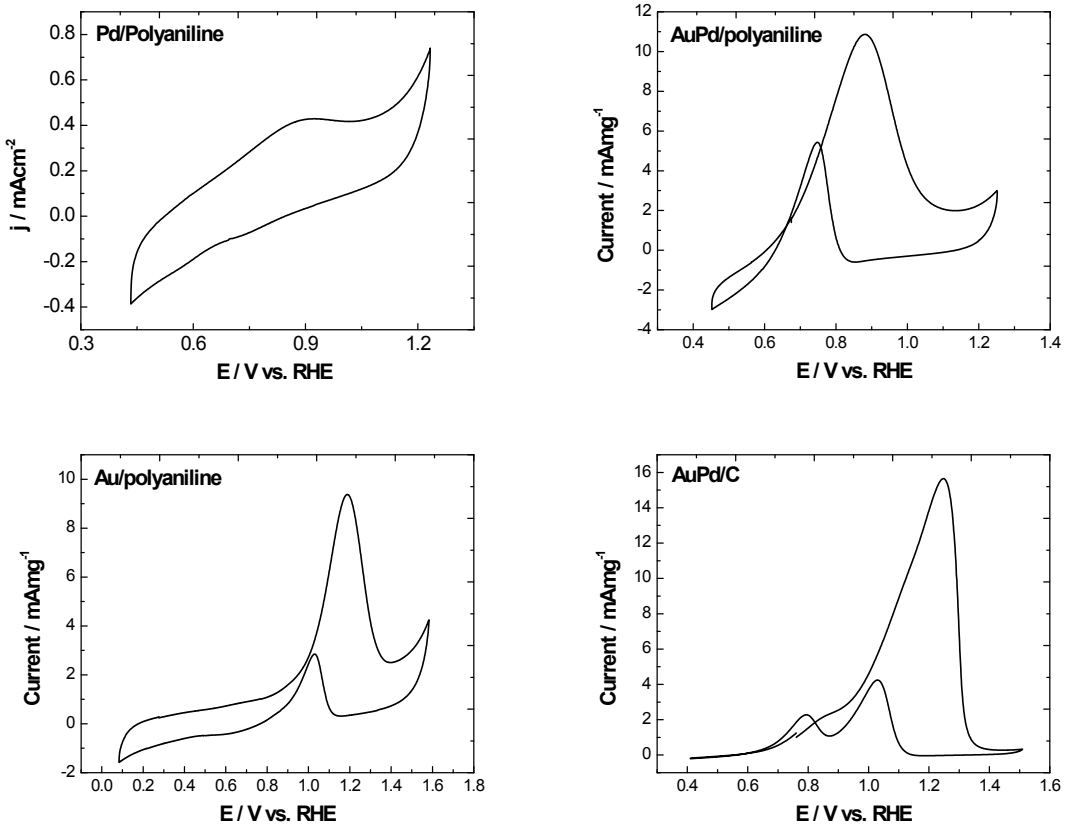

Figure S1. Cyclic voltammograms of Pd/Polyaniline, Au/Polyaniline, AuPd/Polyaniline and AuPd/C for the EG electrooxidation reaction (0.1 M) using 0.3 M KOH as electrolyte.

The effect of the flow rate in the microfluidic fuel cell performance was evaluated at 0.5 M ethylene glycol (Fig. S2). It was found that the open circuit potential (OCP) value varies as function of the flow rate (ethylene glycol:oxygen dissolved streams). The highest OCP was founded at 10:3 ratio. The high flow rate for the anodic stream is related to the density and/or viscosity of the solution due to according with Kjeang et al.[1] the pumping power (W) is a function of the viscosity.

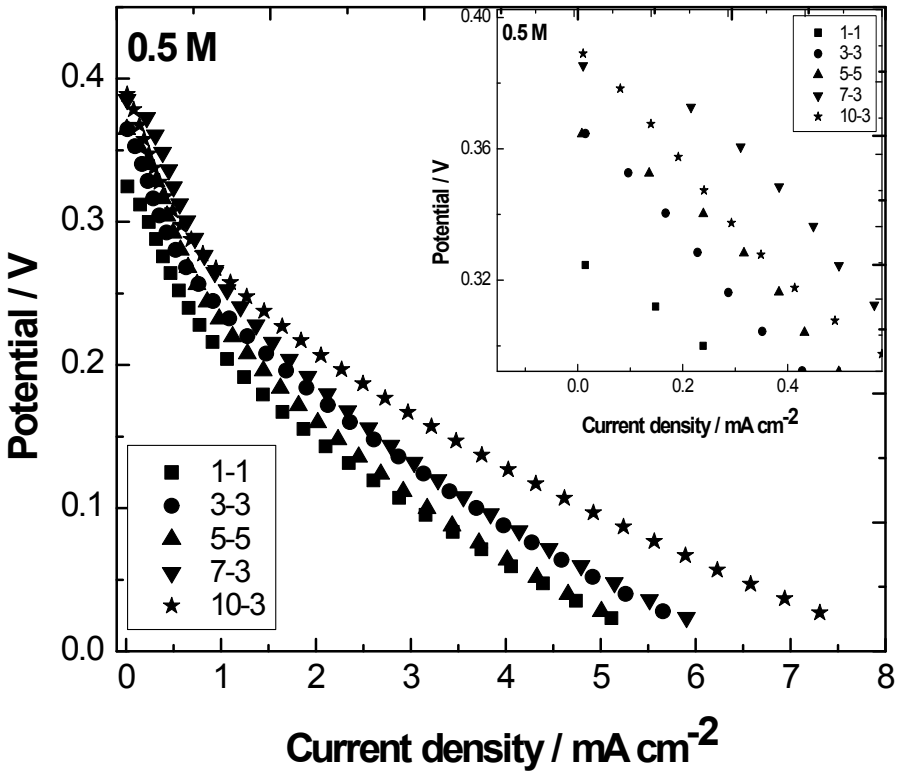

Figure S2 Effect of flow rate on the cell potential.

Device performance cannot be compared with other fuel cells because the literature does not report results for microfluidic devices that use EG as fuel and work at room temperature; however, in Table S1 a relative comparison, based in PEM fuel cells operated at high temperature (>60°C), is shown.

Table S1 Comparison of different EG fuel cells

Anodic material	**Cell type**	**Specific conditions**	**Cell voltage**	**Power density**	**ref**
PdNi	AEM-DEGFC	1M EG, 1 M KOH, **60 °C**	0.655 V	35 $mWcm^{-2}$	[2]
Pt	DEGFC	0.5M EG, 2M H_2SO_4, **80 °C**	0.52 V	20 $mWcm^{-2}$	[3]
PtRu	DEGFC	1.5M EG, 3M H_2SO_4, **110 °C**	0.65		[4]
PuPd/Polyaniline	MFFC	1 M EG, 0.3 M KOH, **25 °C**	0.53	1.2 $mWcm^{-2}$	This work

References

[1] Kjeang, E.; Djilali, N.; Sinton, D. J. Power Sources 2009, **186**, 353

[2] An, L.; Zhao, T. S.; Shen, S. Y.; Wu, Q. X.; Chen, R. *Int. J. Hydrogen Energy* 2010, **35**, 4329.

[3] Livshits, V.; Peled, E. *J. Power Sources* 2006, **161**, 1187.

[4] Peled, E.; Livshits, V.; Duvdevani, T. *J. Power Sources* 2002, **106**, 245