Building an Electrochemical Cell at the Nanoscale Level

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Novel nanomanipulation strategies have been recently developed and applied to the build-up of nanoscale-controlled electrochemical systems [1-3]. The latter methods, however, often require sophisticated equipment and laborious experimental procedures. This study was aimed at evaluating distinct lithography procedures [4] to be applied for nanoelectrodes manipulation in the build-up of an electrochemical cell with nanometric dimensions. We demonstrate the possibility of immobilizing an indium tin oxide (ITO) nanowire electrode on gold contacts deposited atop of a microchip (oxidized Si wafer), as seen in Fig. 1. A polymer protect layer containing an aperture over the sample area was photolithographically deposited over the microchip to isolate the metallic contacts. The background current of the system was monitored by linear sweep voltammetry, as exemplified in Fig. 1e.

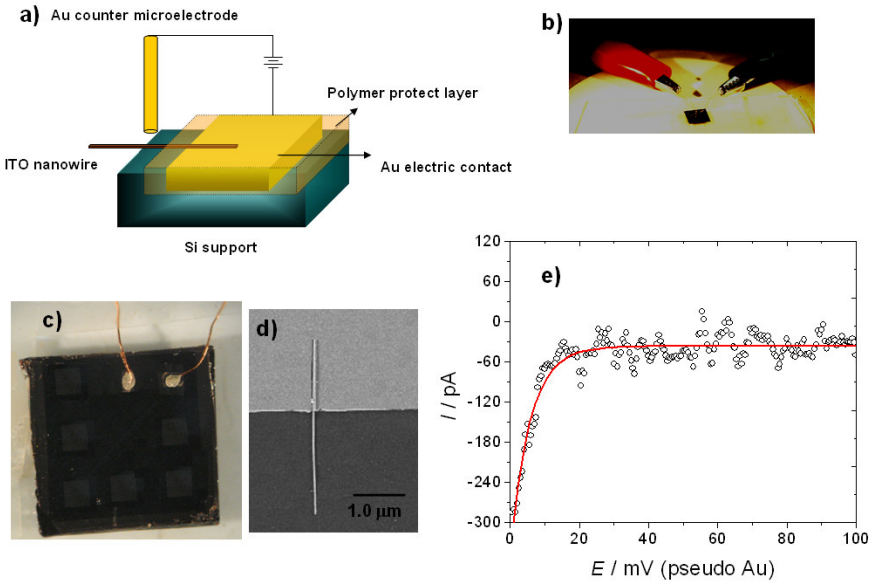

Figure 1. a) Schematic representation of the electrochemical nanocell; **b)** and **c)** connected microchip; **d)** SEM image of ITO nanowire deposited on Au contact **e)** Linear sweep voltammetry of ITO nanowire at pH 7.0 (0.1 mol L^{-1} phosphate buffer solution).

Keywords: single device, nanoelectrochemical cell, ITO nanowire, nanomanipulation,

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[1] R. Schuster, V. Kirchner, P. Allongue, G. Ertl, *Science,* **289**, 7 (2000).
[2] Li. Qin, S. Park, L. Huang, C. A. Mirkin, *Nature,* **289**, 7 (2000).
[3] I. Heller, J. Kong, H. A. Heering, K. A. Williams, S. G. Lemay, C. Dekker, *Nano Letters* **5**, 137 (2005).
[4] A. J. Chiquito, A. J. C. Lanfredi, R. F. M. Oliveira, L. P. Pozzi, E. R. Leite, *Nano Letters*, **7**, 1439 (2007).

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