Electro-controlled Swelling and Water Uptake of a 3-D Conducting Polypyrrole Hydrogel

Intumescimento eletrocontrolado e absorção de água em um hidrogel 3-D de polímero condutor

J. L. S. Antonio [1,*], T. Lindfors[2] e S. I. Córdoba de Torresi[1]

[1] Instituto de Química, Universidade de São Paulo. São Paulo (SP), Brazil.
[2] Åbo Akademi University, Laboratory of Analytical Chemistry, Turku, Finland.

Abstract: Polypyrrole 3D hydro-sponges (Ppy-HS) with tubular structure have been synthesized and electrochemically characterized [1]. The FTIR-ATR technique was employed to study the water uptake of the hydro-sponges in different conditions. This technique presents several advantages compared with conventional swelling measurements due to its specificity that allows analyzing water uptake kinetics at molecular level. In combination with mathematical modelling, the FTIR-ATR technique enables also the calculation of the water diffusion coefficients in the hydrogels. The experimental setup also allows studying electro-swelling of the hydro-sponges [2].

The FTIR-ATR water uptake results of Ppy-HS electro-swelling are presented in the Figure 1a [2]. They are complementary to those obtained with the EQCM-D technique (Figure 1b) and make possible to determine the actual role played by water in the ionic exchange occurring in conducting polymers during their redox processes. While EQCM-D shows the whole mass change in the film provoked by injection/ejection of ions and solvent molecules, the FTIR-ATR follows only the water flux, thus allowing the separation of the solvent contribution. To best of our knowledge, this was the first time that the water uptake by conducting polymers has been studied with the FTIR-ATR technique and the ionic exchange in the polymeric structure better discussed.

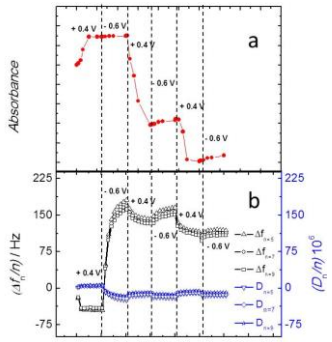

Figure 1. Characterization of the electro-swelling properties of the Ppy-HS using different experimental techniques: (a) absorbance changes in the FTIR-ATR water band at 3200 cm^{-1}; (b) EQCM-D changes.

Agradecimentos:
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Referências:

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[2] J. L. Antonio, L. Höfler, T. Lindfors, S. I. Cordoba de Torresi, *ChemElectroChem* 3 (2016), 2146-2152.

* **e-mail do autor principal:** jadielson.lucas@gmail.com