Cellular Adhesion and Proliferation on Poly(3,4-ethylenedioxythiophene): Beneficial effects in the Electroactivity of the Conducting Polymer

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Among conducting polymers, those based on polythiophene have received significant attention owing to a wide range of promising electronic, electrochemical and optical applications. In this context, poly(3,4-ethylenedioxythiophene) (PEDOT) is considered the most successful polythiophene derivative because of its interesting properties [1-3], which allow its practical use as antistatic coating for photographic films, electrode material in inorganic electroluminescent lamps, material for through-hole plating of printed circuit boards, and as anticorrosive additive for organic coatings.

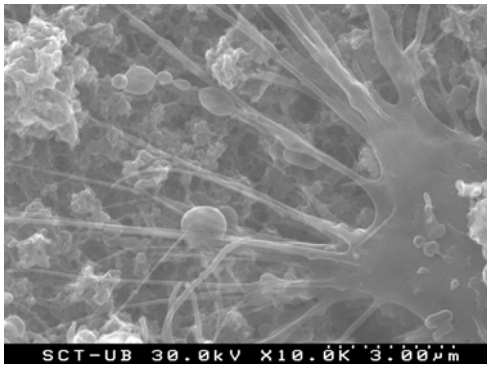

Fig. 1. Scanning electron micrograph of cells adhered to PEDOT, 10000 increases.

Driven by recent advances in biomedicine and biotechnology, the application of conducting polymers within these fields has motivated a great interest during the last years. For instance, polythiophene derivatives have been used to design molecular actuators, which should be considered as artificial devices able to mimic natural muscles [4]. Conducting polymers, and more specifically PEDOT, have been also used to develop sensors able to detect biomolecules, like for instance glucose.

In this work, cell adhesion and proliferation in PEDOT has been investigated (see Fig. 1). Results show that eukaryote epithelial cells Hep-2 present significant activity in the surface of PEDOT electrodeposited on stainless steel electrodes, no sign of cytotoxicity being detected for this conducting polymer. Indeed, seeded and cultured cells bound better to PEDOT than to uncoated stainless steel, the latter substrate being used as a control. Furthermore, the electrochemical characteristics PEDOT covered with cells was determined in different biological media using cyclic voltammetry experiments. Results reveal a significant increase in the electroactivity of this material when it is covered with a cellular monolayer. The overall of the results evidences not only the biocompatibility of PEDOT with Hep-2 cells but also their electrocompatibility [5].

Acknowledgements: This work was supported by MCYT and FEDER funds with Grants MAT2003-00251 and MAT2006-04029, and by the "Catedra Applus+" in Automotive Safety.

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