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Synthesis and characterization by electrochemical methods of PPy-PDA thin layers

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A new type of composite material based on Polypyrrole-Polydopamine (PPy-PDA) has recently emerged due to its possible scientific and industrial applications. It exhibits relevant properties that the components do not possess. Synthesis of PPy-PDA was first reported using a chemical oxidant to obtain a nanoparticulated material, that showed higher conductivities and better adhesion on glass substrates compared to PPy (1). However, the chemical route is not suitable for the formation of thin films needed to functionalize electrode surfaces, and to be used in several applications. Recently, it was observed the catalysis of the dopamine in the synthesis of PPy-PDA when it was obtained by electrochemical methods. As well as excellent electrical and biological properties of the composite (2, 3, 4). However, the electrodeposition mechanism, the chemical composition of the material and the effect of electric and chemical variables on properties, are issues still quite unknown. Herein, in this work a study of the electrochemical synthesis of PPy-PDA films on gold electrodes was conducted. We explored the effect of the current density during galvanostatic synthesis, on the electrochemical properties of the resulting material. Which were evaluated by cyclic voltammetry and electrochemical impedance spectroscopy. On the other hand, the electrocatalytic properties were assessed by using the ferrocyanide/ferricyanide redox probe. Additionally, we studied the synthesis of the material by potentiodynamic method to find evidence of the possible mechanism.

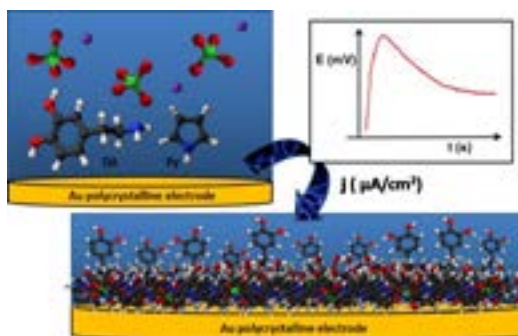


Figure 1. Schematic representation of the polypyrrole-polydopamine formation over gold electrode.

Recent Publications

1. W. Zhang, Z. Pan, F. K. Yang and B. Zhao, (2015) *Adv. Funct. Mater.* 25: 1588–1597.
2. S. Kim, L. K. Jang, H. S. Park and J. Y. Lee (2016) *Sci. Rep.* 6: 0–6.
3. J. Tan, Z. Zhang, Y. He, Q. Yue, Z. Xie, H. Ji, Y. Sun, W. Shi and D. Ge, (2017) *Synth. Met.* 234: 86–94.
4. S. Kim, L. K. Jang, M. Jang, S. Lee, J. G. Hardy and J. Y. Lee (2018) *ACS Appl. Mater. Interfaces* 10: 33032–33042.

Biography

Ricardo Barrera Gutiérrez studied chemistry in the National University of Colombia where he started in the world of electrochemistry in a research project associate his bachelor thesis “galvanostatic synthesis and electrochemical characterization of copper nanofoams” that produced a publication. Now he is a graduate student in Universidad de los Andes where he develops his research thesis in conductive polymers.