Graphene oxide based electrochemical sensor for dopamine detection

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Abstract

Dopamine (DA) is one of the most important neurotransmitters that influences the processes that involve the memory, sleep, mood, learning and so on. DA concentration in human body fluids is related to neurodegenerative diseases, such as Parkinson and Alzheimer's [1]. These pathologies are due to the formation of amyloids plaques that block part of the brain [2].
The principal analytical methods to detected dopamine are Enzyme Linked ImmunoSorbet Assay and High Pressur Liquid Chromatrography. Despite these techniques have low LOD, high selectivity and sensitivity, they are expensive, hard to handle and time consuming.
To achieve a real-time screening of DA, electro-chemical sensors are perfect candidates. The electrodes fabrication is cheap, reproducible, fast and the features of these sensors are good. The main disadvantage of this technique is the interference from uric acid (UA) and ascorbic acid (AA). These compounds are always present in every body fluids and have redox potential close to the DA one. This make the detection of DA harder because the peaks of AA and UA can overlap with the DA one. Thus it is necessary develop a sensor with electrochemical active materials that present high selectivity.
In this work we show the preliminary results concerning the development and the optimiza-tion of a flexibleand cheap electrochemical DA sensor. The activematerial of sensors is based on reduced graphene oxide with Au or Pt nano-particles (NPs) and was obtained by co-electrodeposition into a ITO-PET substrate (Figure 1). The electrodeposition parameters have been optimized in order to increase the DA peak and obtain a low LOD, in the nM range. The detection of dopamine was performed by square wave voltammetry and linear cyclo-voltammetry. The sensors were also tested using synthetic urine (in order to simulate a real sam-ple where DA concentration is usually lower than 500 nM). Preliminary results show a negli-gible interference from ascorbic and uric acid, a very wide linear

References

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[2] S. Kar, S.P. Slowikowski, D. Westaway, and H.T. Mount, J. Psychiatry Neurosci. 29 (2004) 427–441.

Figures

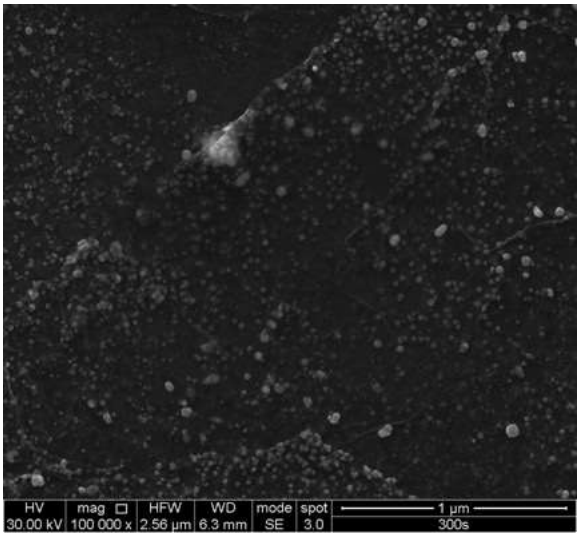

Figure 1: Figure illustrating electrode surface made of reduced graphene oxide and Au nanoparticles both deposited by electrodeposition on ITO/PET substrate.