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Abstract

Electrochemical Deposition of Silver—Gold Nanoparticles for Sensitive Dopamine Detection †

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Dopamine (DA) is a catecholamine neurotransmitter, which plays a crucial role as chemical messengers in the central nervous system, hormonal, cardiovascular and renal systems. Recently, much attention has been paid to trace level determination of DA, because small changes in concentration are coupled with various disorders such as Alzheimer's disease, epilepsy, Parkinson's disease and schizophrenia [1]. In this context, the selective and sensitive approach for DA level determination is vital for diagnosing diseases.

Due to its electroactivity, DA can be detected by electrochemical techniques, but requires large oxidation potential, which results in the formation of phenoxy radicals and, respectively, formation of polymeric films on the electrode, passivating the surface. It has been shown that metal nanoparticles in combination with carbon material can enhance the sensing activity of electrodes for dopamine oxidation [1–3]. Carbon nanotubes (CNTs) decorated with different metallic nanoparticles have been frequently used to modify the surfaces of commercially available screen-printed electrodes to decrease the overpotential and improve sensitivity.

This work demonstrates the effective surface electrodeposition of bimetallic Ag-Au nanoparticles onto CNTs substrate for sensitive and selective detection of dopamine. The double-pulse amperometry method has been used for Ag-Au deposition, with different deposition parameters such as pulse time, metal ions ratio and total time of deposition. Scanning electron microscopy was used for morphologic characterization of deposited nanoparticles, while cyclic voltammetry and differential pulse voltammetry were involved in the electrochemical characterization of the sensors towards dopamine detection.

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