Electrochemical detection of glucose using Cu electrode coated with palladium nanoparticles

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Numerous of glucose sensors without using enzymesat bare platinum or gold electrodes was proposed [1-4] in literature. However, such electrodes suffer from low sensitivity, poor selectivity and poisoning by intermediates [5] which have led to the search for other active materials for glucose oxidation. Some of these drawbacks were overcome by modifying the surface of noble metals with different metal and layers [6]. Palladium (Pd) is the preferred metal for this aim due to its good electrocatalytic behavior and some various advantageous properties. In the present work, the non-enzymatic voltammetric detection of glucose using a pd nanoparticles modified Cu electrode is described. Palladium nanoparticles synthesized by a new green method were coated on the surface of Cu electrode with ultrasound. The electrochemical oxidation of glucose in 0.1 M NaOH solution was investigated using cyclic voltammetry. The method is suitable for determination o glucose in a wide concentration range from 100 nM to 100 µM. To our knowledge, this is the first report on using palladium nanoparticles coated on the surface of Cu electrode to detection of glucose with a better sensitively and stability. The proposed glucose biosensor was successfully applied for the determination of glucose in various samples.

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Elecrocatalytic and selective determination of D-penicillamine in the presence of tryptophan using a modified carbon nanotube paste electrode

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Two amino acids, D-penicillamine (D-PA) and tryptophan (TRP), could be simultaneously determined in an aqueous solution (pH 7.0) using a novel benzoylferrocene (BF) modified carbon nanotube paste electrode (BFCNPE). D-Penicillamine (D-PA) is an aminothiol and a potent copper chelating agent [1]. D-PA is currently approved for the treatment of Wilson's disease and rheumatoid arthritis. Based on its ability to effectively chelate and remove copper, it has also been investigated as an antiangiogenic agent [2]. Tryptophan (TRP) is one of the essential amino acids which can-not be synthesized by the organism. This compound is a precursor for serotonin (a neuro-transmitter), melatonin (a neurohormone), and niacin [3].
This work indicate that the electrode is efficient in terms of its electrocatalytic activity for the oxidation of D-PA, leading to an overpotential reduced by more than 155 mV. Using square wave voltammetry (SWV), measurement of D-PA and TRP in one mixture could be done independently from each other by a potential difference of about 205 mV. The proposed electrochemical sensor exhibited a linear calibration plot ranged from 1.0×10^{-6} to 8.0×10^{-4} M with a detection limit of 1.3×10^{-7} M for D-PA. Finally, the proposed method was applied to the determination of D-PA in D-PA capsule.

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Fabrication of graphene/ chitosan films by two step elecrodeposition

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Electrochemical deposition is a versatile surface modification technology for the realization of advanced coatings for electrochemical sensor applications. This paper proposed a simple electrodeposition approach to synthesis graphene- chitosan composite onto glassy carbon electrode. The whole procedure was simple and it last only several minutes. Moreover, combining the advantages of graphene(large surface- to- volume ratio and high conductivity) and chitosan(good mechanical strength and adsorption), the composite film could be highly efficient to use in surface electrode [1-3]. Although the feasibility of chitosan electrodeposition was already demonstrated, here we have showed that chitosan acts as a protective layer enhancing the stability of graphene sensor. Graphene can be synthesized by chemically reduction of graphene oxide. On the other hand, the use of reducing agents also have several disadvantages. These materials have a potential health hazard and high expense. Thus graphene electrodeposition approach for construction of graphene based was environmental friendly. Also, compared with conventional methods producibility of film preparation has significantly improved [4]. Graphene oxide structure were investigated by Fourier trasform infra red spectroscopy (FT-IR) and scanning electron microscopy (SEM). The electrode was characterized using differential pulse voltammetry (DPV) and cyclic voltammetry (CV). Here we used cyclic voltammetry for graphene deposition and chorno potentiometry for chitosan deposition. The effect of influential parameters such as mass of graphene oxide, pH, cycle numbers, the sonication time and scan rate in firs step deposition and chitosan solution concentration, pH, time and current of deposition in second step were optimized to obtain the maximal sensitivity.

Key words: Chitosan, Electrochemical deposition, Graphene

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