

عنوان مقاله:

Electrodeposited Gold Nanoparticles on Glassy carbon Electrode: Correlation between Electrodeposition Time and the Amount of Immobilized Gold Nanoparticle

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خلاصه مقاله:

The glassy carbon electrode, GCE, is widely used as working electrode in different biosensors. Up to now, various methods have been developed to improve the biosensing properties of GCE. Generally, improving of electrical conductivity of this electrode is a major aim of these methods. Recently, immobilization of gold nanoparticles on the surface of glassy carbon electrode using electrodeposition technique is widely utilized for this intention. However, some aspects, particularly optimum condition of this technique are still unclear. So, the effect of electrodeposition time on the amount of immobilized gold nanoparticle at the surface of glassy carbon electrode, is investigated and reported in this article. Chloroauric acid ($\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$) and potassium ferricyanide ($\text{K}_4\text{Fe}(\text{CN})_6$) purchased from Sigma – Aldrich. NaNO_3 , potassium phosphate (KH_2PO_4) and dipotassium phosphate (K_2HPO_4) obtained from Merck Ltd. Alumina powder with 1 μm and 0.3 μm diameter obtained from Metrohm AG, Swiss. All aqueous solutions were prepared in double distilled water with a resistance of $18.0 \text{ M}\Omega \text{ cm}^{-1}$. Double distilled, deionized water was prepared using ion exchange system (Millipore, France). Glassy carbon electrode was carefully polished by 1 μm and 0.3 μm alumina powder, respectively. Then, the electrode was rinsed with ethanol 96% using an ultrasonic cleaner (Elma 530H). At the next stage, gold nanoparticles were electrodeposited in deaerated NaNO_3 solution containing 0.25 mM chloroauric acid. For electrodeposition, chronoamperometry method using -0.3 V was utilized at different times (0, 10, 120, 240, 420 and 600s) at 10°C . In order to evaluation of electrode responses at each electrodeposition time, the voltammograms of modified glassy carbon were recorded in 65 mM ferrocyanide potassium (pH 7) by cyclic voltametry experiments (DropSens 400 μ , Spain). Additionally, to evaluate the amount of gold nanoparticles immobilization at the surface of glassy carbon electrode, scanning electron microscopy images were obtained (VEGA3 TESCAN, Czech Republic) at 10s voltage exertion during electrodeposition process. Figure 1 show the morphology and distribution of gold nanoparticles on the surface of glassy carbon electrode when 10s was selected for voltage exertion during electrodeposition. The SEM image analysis in which automatically performed by an electron microscope instrument indicated that only 7% of glassy carbon electrode surface was covered by gold nanoparticle with the sizes between 35 to 45 nm. At the next stage, cyclic voltametry experiments carried out. The ... cathodic(A) and anodic (B) peak

کلمات کلیدی:

