

عنوان مقاله:

A simple and efficient nano-structured gold film sensor for gallic acidelectrochemical determination

محل انتشار:

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خلاصه مقاله:

A straightforward, rapid and green approach was proposed for the fabrication of gold nonporous film. A gold electrode was firstly oxidized under a high potential of 5 V, and ascorbic acid, as a nontoxic reducing agent, was then chosen to reduce the gold oxide. This process gives a fractal gold nonporous film on the top of the gold electrode in a way of completely green chemistry. The nanostructure modified electrode greatly facilitates the electrochemical oxidation of Gallic acid (GA). As the gold nonporous film was formed in situ on the gold electrode, additional immobilization procedures are not necessary. A sensitive sensor can be easily developed for the detection of GA. In the present study, the oxidation peak current of the GA in a 0.10 M phosphate buffer solution was optimized for its determination by the differential pulse voltammetry method. The variables which optimized include scan rate, step potential, and pH. Then, under the optimized conditions the dynamic range for GA 41 to 150 μM and the detection limit was found to be 1.2 nM. Cyclic voltammetry and other electrochemical methods such as chronocoulometry, was used to investigate the electrochemical behavior of Gallic acid on the gold nano-structured modified electrode. Using these methods, the diffusion coefficient ($D = 1.03 \times 10^{-4} \text{ cm}^2 \text{ s}^{-1}$) and the kinetic parameters such as the electron transfer coefficient ($\alpha = 0.55$) and exchanging current density ($j_0 = 4.28 \text{ cm}^{-2}$) for GA were determined. The number of proton and electron transfer for the oxidation of GA was investigated to be two protons and two electrons.

کلمات کلیدی:

Gold nano-structured film, Gallic acid (GA), electro catalysis, Cyclic voltammetry

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