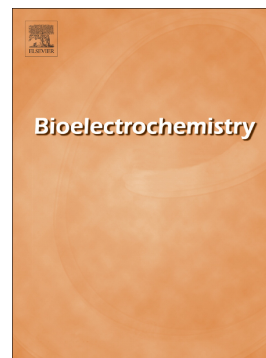


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Double strand DNA -based determination of menadione using a Fe₃O₄ nanoparticle decorated reduced graphene oxide modified carbon paste electrode

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Abstract

In this work an electrochemical label free DNA biosensor (ds-DNA) for the determination of menadione (MD) was developed. The biosensor was constructed using a modified nanocomposite consisting of Fe₃O₄ nanoparticles decorated reduced graphene oxide (Gr) on a carbon paste electrode (CPE). Scanning electron microscope (SEM), energy dispersive X-ray (EDAX) and Fourier transform infrared (FT-IR) spectroscopy confirmed the structure of the synthesized nanocomposites (electrode composition). The Gr-Fe₃O₄ nanocomposites formed a sensitive layer with large surface area. Electrochemical studies revealed that modification of the electrode surface with ds-DNA and Gr- Fe₃O₄ nanocomposite significantly increases the oxidation peak currents and reduces the peak potentials of MD. Under the optimum conditions, calibration curve was linear in the range of 0.3 – 100.0 nM with a detection limit of 0.13 nM. The relative standard deviation for 50.0 nM was 3.90 % (n=5). The proposed biosensor was successfully applied to the determination of MD.

Keywords: DNA biosensor, Carbon paste electrode, Menadione, Nanocomposite

1. Introduction

Menadione (vitamin K₃, 2-methyl- 1,4-naphthoquinone, MD) is a synthetic pro-vitamin which has shown antihemorrhagic and anti-inflammatory activity because of the presence of the quinone function group in its structure [1]. Recently, much interest has been generated in MD due to its potential as a clinically useful antitumor agent.

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