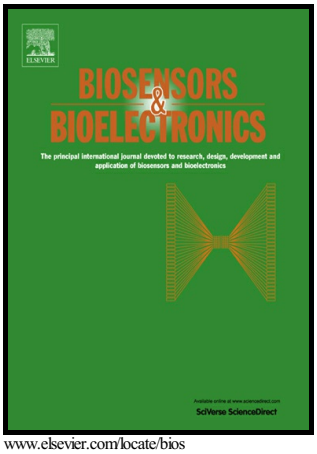

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Novel MWCNTs/Graphene Oxide/ Pyrogallol Composite with Enhanced Sensitivity for Biosensing Applications

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Abstract

A novel and highly sensitive biosensor employing graphene oxide nano-sheets (GO), multiwalled carbon nanotubes (MWCNTs), and pyrogallol (PG) was fabricated and utilized for the sensitive determination of omeprazole (OME). The morphological and structural features of the composite material were characterized using different techniques. The modified electrode showed a remarkable improvement in the anodic oxidation activity of OME due to the enhancement in the current response compared to the bare carbon paste electrode (CPE). Sensor composition and measurement conditions were optimized using an experimental design. Differential pulse voltammetry (DPVs) exhibited two expanded linear dynamic ranges of 2.0×10^{-10}–6.0×10^{-6} M and 6.0×10^{-6} – 1.0×10^{-4} M for OME at pH 7 with a detection limit of 1.02×10^{-11} M. The practical analytical utilities of the modified electrode were demonstrated by the accurate determination of OME in pharmaceutical formulation and human serum samples with mean recoveries of 100.97% and 98.58%, respectively. The results clearly revealed that the proposed sensor is applicable to clinical analysis, quality control and routine determination of drugs in pharmaceutical formulations.

Keywords: Omeprazole; graphene oxide; MWCNTs; pyrogallol; biosensor

1. Introduction

Among the most considerable substituted benzimidazole sulfoxides is omeprazole (OME; 5-methoxy-2[[(4-methoxy-3,5-dimethyl-2-pyri-dinyl) methyl] sulphinyl]-1Hbenzidimazole, Scheme 1) that functions as a proton pump inhibitor in