

Electrochemical Biosensor Platform with Graphene Nanosheets Decorated ITO Electrode for Folic Acid Sensing

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Abstract

A novel and highly sensitive amperometric nanosensor was fabricated by immobilizing dihydrofolate reductase (DHFR) nanoparticles onto platinum nanoparticles (PtNPs) and graphene nanosheets (GrNs) decorated indium tin oxide (ITO) electrode for folic acid (FA) level detection. The modified working ITO electrode (i.e. DHFR NPs/PtNPs/GrNs/ITO) was characterized by scanning electron microscope (SEM), cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) at each steps of its construction. The nanosensor (DHFR NPs/PtNPs/GrNs/ITO) demonstrated a wide linear detection range of 5–100 nM and a low detection limit of 0.52 nM along with better reproducibility. Its optimal performance was observed at a pH of 7.0 and a temperature of 30 °C. The fabricated nanosensor showed excellent sensitivity and stability, and was successfully applied for quantification of FA in human serum samples.

Keywords

Folic acid, electrochemical nanosensor, Enzyme nanoparticles, Serum, Cyclic voltammetry.