Electrochemical DNA Biosensor Based on Graphene Oxide-Chitosan Hybrid Nanocomposites for Detection of Escherichia Coli O157:H7

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In this article, we present a simple and sensitive electrochemical DNA biosensor based on graphene oxide (GO)/chitosan (CS) hybrid nanocomposites modified glassy carbon electrode (GCE) for detection of Escherichia coli O157:H7 (E.coli O157:H7). The morphology and composition of GO and hybrid nanocomposites were characterized by transmission electron microscope (TEM), X-ray powder diffraction (XRD), field emission scanning electron microscopy (FESEM), and Fourier transform infrared spectrum (FTIR). Cyclic voltammetry investigations indicated that the GO/CS/GCE showed excellent electron transfer ability and good linear relation. Under the optimal hybridization conditions, electrochemical impedance spectroscopy (EIS) responses of ssDNA/GO/CS/GCE biosensor were in linear with the target DNA in the concentration range from 1×10^{-14} to 1×10^{-8} M with the detection limit as 3.584×10^{-15} M (3σ). Moreover, differential pulse voltammetry (DPV) studies revealed good specificity and excellent ability of ssDNA/GO/CS/GCE biosensor to distinguish complementary, 1-base mismatched DNA, 2-base mismatched DNA and multi-base mismatched DNA. The developed strategy in this research revealed that the GO/CS modified electrode possess excellent performance for detecting of Escherichia coli O157:H7 DNA.

Keywords: Graphene oxide, chitosan, nanocomposites, Electrochemical DNA biosensor, Escherichia coli

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