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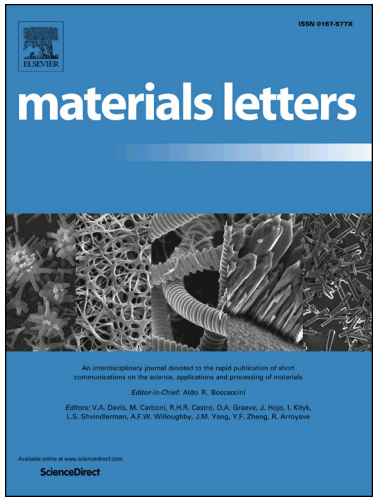

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Synthesis of Single-walled Carbon Nanotubes–Chitosan Nanocomposites for the Development of an Electrochemical Biosensor for Serum Leptin Detection

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Abstract

Single-walled carbon nanotubes (SWCNTs) cannot be stably dispersed in aqueous solutions, which greatly limit their use in biomedical applications. In this study, functionalized SWCNTs were dispersed in chitosan (CS) solution, which greatly promoted the water solubility of SWCNTs and formed a uniformly dispersed solution. The use of EDC/NHS crosslinking solution to activate carboxyl groups into amino groups, greatly improved the affinity of SWCNTs for biomolecules. TEM characterization of the nanocomposites showed that SWCNTs were uniformly dispersed in CS solution. Cyclic voltammetry and electrochemical impedance spectroscopy revealed that the nanocomposites covering the glassy carbon electrode (GCE) greatly improved the conductivity of the electrodes and enhanced the electron transfer rate. A simple electrochemical biosensor for the detection of serum leptin was successfully fabricated with the functionalized-SWCNT–CS biopolymer nanocomposites on GCEs. The biosensor demonstrated a wide linear range (0–1000ng mL^{-1}) and a detection limit of 5pg mL^{-1} (S/N=3).

Key words: Nanocomposites, Carbon nanotubes, Chitosan, Leptin, Electrochemical biosensor

1. Introduction