Cyclic Voltammetry and Electrochemical Impedance Spectroscopy of Partially Reduced Graphene Oxide - PEDOT: PSS Transducer for Biochemical Sensing

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Abstract
Electro-transfer kinetics and impedances at the electrode-solution interface affect biosensor performance. Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) are used to understand the reversibility of electron transfer and impedance at the electrode-solution interface, respectively. Effective surface areas calculated based on the Randles- Sevick equation for a bare screen-printed carbon electrode (SPCE), a graphene oxide (GO)-poly (β,α-ethylenedioxythiophene):poly(styrenesulfonate) acid (PEDOT: PSS)-modified electrode (GO-PEDOT: PSS/SPCE), a partially reduced graphene oxide-PEDOT: PSS-modified electrode (pGO-PEDOT: PSS/SPCE), and glucose oxidase (GOX) cross-linked with glutaraldehyde on partially reduced graphene oxide PEDOT: PSS-modified electrode (GOX/pGO-PEDOT: PSS/SPCE) are 0.0717 mm², 0.0794 mm², 0.219 mm², and 0.160 mm², respectively. Nyquist plots from EIS showed charge transfer resistance (Rct) of 430 μΩ, 148.2 μΩ, 200.7 μΩ, and 203.6 μΩ, respectively, for the same electrodes. The high effective surface area and the Rct of pGO-PEDOT: PSS/SPCE indicate that the pGO-PEDOT: PSS composite is suitable as a transducer layer for glucose biosensing.

Keywords
Author Keyword(s): cyclic voltammetry; electrical impedance spectroscopy; PEDOT: PSS; reduced graphene oxide; glucose oxidase; biosensor

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