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

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2018 IEEE-EMBS CONFERENCE ON BIOMEDICAL ENGINEERING AND SCIENCES (IECBES)
Book Group Author(s): IEEE
Book Series: IEEE EMBS Conference on Biomedical Engineering and Sciences
Pages: 330-335
Published: 2018
Document Type: Proceedings Paper

Conference

Conference: IEEE-EMBS Conference on Biomedical Engineering and Sciences (IECBES)
Location: Kuching, MALAYSIA
Date: DEC 03-06, 2018
Sponsor(s): SARAWAK Convent Bur; Physiolog Measurement

Abstract

Electron-transfer kinetics and impedance 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-Sevcik equation for a bare screen-printed carbon electrode (SPCE), a graphene oxide (GO)-poly (3,4-ethylenedioxythiophene):polystyrenesulfonic acid (PEDOT: PSS)-modified electrode (GO-PEDOT: PSS/SPCE), a partially reduced graphene oxide-PEDOT: PSS-modified electrode (prGO-PEDOT: PSS/SPCE), and glucose oxidase (GOx) crosslinked with glutaraldehyde on partially reduced graphene oxide-PEDOT: PSS-modified electrodes (GOx/prGO-PEDOT: PSS/SPCE) are 0.0717 mm(2), 0.0794 mm2, 0.219 mm(2), and 0.160 mm(2), respectively. Nyquist plots from EIS show charge transfer resistance (R-ct) of 430 mu Omega, 148.2 Omega, 200.7 Omega, and 209.6 Omega, respectively, for the same electrodes. The high effective surface area and the R-ct of prGO-PEDOT: PSS/SPCE indicate that the prGO-PEDOT: PSS composite is suitable as a transducer layer for glucose biosensing.

Keywords

Author Keywords: cyclic voltammetry; electrical impedance spectroscopy; PEDOT: PSS; reduced graphene oxide; glucose oxidase; biosensor
KeyWords Plus: DIRECT ELECTRON-TRANSFER; EFFICIENCY

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Funding

Funding Agency	Grant Number
Malaysia Ministry of Education, Fundamental Research Grant Scheme	FRGS17-037-0603
IUM Research Initiative Grant Scheme	RIGS16

View funding text

Publisher

IEEE, 345 E 47TH ST, NEW YORK, NY 10017 USA

Categories / Classification

Research Areas: Engineering

Web of Science Categories: Engineering, Biomedical

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