Direct Electrodeposition to Fabricate Vertically Aligned Reduced Graphene oxide–diphenylalanine Network for Highly Sensitive Amperometric Nitromethane Biosensors

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doi: 10.20964/2020.12.76

Received: 17 August 2020 / Accepted: 19 October 2020 / Published: 31 October 2020

In this paper, vertically aligned electrochemically reduced graphene oxide-diphenylalanine (VA-ErGO-FF) network was directly prepared at glassy carbon (GC) electrode's surface from graphene oxide-diphenylalanine (GO-FF) dispersions by using a pulsed electrodeposition technique. The electrochemical experiments and scanning electron microscopy revealed properties in VA-ErGO-FF network. Model molecule hemoglobin was further fastened onto VA-ErGO-FF network to construct electrochemical nitromethane (CH₃NO₂) amperometric biosensors. Electrochemical results revealed that hemoglobin in the VA-ErGO-FF network retained its bioactivity, showing two quasi-reversible redox peaks and high bioelectrocatalytic activity to CH₃NO₂. Biosensor indicated extensive linear response scope as 1.0×10^{-6} - 5.0×10^{-4} mol L⁻¹ in optimum circumstances, corresponding to low detection limit as 5.0×10^{-7} mol L⁻¹. It had been found VA-ErGO-FF network is a promising platform with bright prospects in the application of electrochemical biosensor for extraordinary biocompatibility as well as favorable charge-transfer capability.

Keywords: vertically aligned, electrochemically reduced graphene oxide-diphenylalanine, hemoglobin, direct electron transfer, nitromethane

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