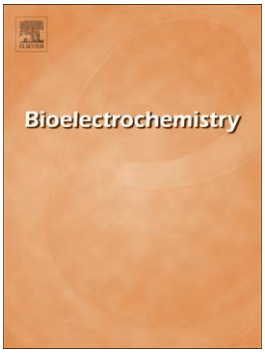

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PII: S1567-5394(16)30040-8
DOI: doi: 10.1016/j.bioelechem.2016.03.006
Reference: BIOJEC 6933

To appear in: *Bioelectrochemistry*

Received date: 7 November 2015
Revised date: 25 March 2016
Accepted date: 26 March 2016

Please cite this article as: Seetharamaiah Nandini, Seetharamaiah Nalini, M.B. Madhusudana Reddy, Gurukar Shivappa Suresh, Jose Savio Melo, Pathappa Niranjana, Jakkid Sanetuntikul, Sangaraju Shanmugam, Synthesis of one-dimensional gold nanostructures and the electrochemical application of the nanohybrid containing functionalized graphene oxide for cholesterol biosensing, *Bioelectrochemistry* (2016), doi: 10.1016/j.bioelechem.2016.03.006

Synthesis of one-dimensional gold nanostructures and the electrochemical application of the nanohybrid containing functionalized graphene oxide for cholesterol biosensing

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Abstract

This manuscript reports a new approach for the synthesis of one dimensional gold nanostructure (AuNs) and its application in the development of cholesterol biosensor. Au nanostructures have been synthesized by exploiting β-diphenylalanine (β-FF) as an sacrificial template, whereas the Au nanoparticles (AuNPs) were synthesized by ultrasound irradiation. X-ray diffractometer (XRD), scanning electron microscope (SEM) and energy dispersive analysis of X-rays (EDAX) have been employed to characterise the morphology and composition of the prepared samples. With the aim to develop a highly sensitive cholesterol biosensor, cholesterol oxidase (ChOx) was immobilized on AuNs which were appended on the graphite (Gr) electrode via chemisorption onto thiol-functionalized graphene oxide (GO-SH). This Gr/GO-SH/AuNs/ChOx biosensor has been characterized using cyclic voltammetry (CV), electrochemical impedance spectroscopy and chronoamperometry. CV results indicated a direct electron transfer between the enzyme and the electrode surface. A new potentiostat intermitant titration technique (PITT) has been studied to determine the diffusion coefficient and maxima potential value. The proposed biosensor showed rapid response, high sensitivity, wide linear range and low detection limit. Furthermore, our AuNs modified electrode showed excellent selectivity, repeatability, reproducibility and long term stability. The proposed electrode has also been used successfully to determine cholesterol in serum samples.

Keywords: gold nanostrucutres, functionalized graphene oxide, electrochemical biosensor, β-diphenylalanine, peptide nanotubes, cholesterol