World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:11, No:01, 2017

Non Enzymatic Electrochemical Sensing of Glucose Using Manganese Doped Nickel Oxide Nanoparticles Decorated Carbon Nanotubes

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Abstract : Diabetes is one of the leading cause of death at present and remains an important concern as the prevalence of the disease is increasing at an alarming rate. Therefore, it is crucial to diagnose the accurate levels of glucose for developing an efficient therapeutic for diabetes. Due to the availability of convenient and compact self-testing, continuous monitoring of glucose is feasible nowadays. Enzyme based electrochemical sensing of glucose is quite popular because of its high selectivity but suffers from drawbacks like complicated purification and immobilization procedures, denaturation, high cost, and low sensitivity due to indirect electron transfer. Hence, designing a robust enzyme free platform using transition metal oxides remains crucial for the efficient and sensitive determination of glucose. In the present work, manganese doped nickel oxide nanoparticles (Mn-NiO) has been synthesized onto the surface of multiwalled carbon nanotubes using a simple microwave assisted approach for non-enzymatic electrochemical sensing of glucose. The morphology and structure of the synthesized nanostructures were characterized using scanning electron microscopy (SEM) and X-Ray diffraction (XRD). We demonstrate that the synthesized nanostructures show enormous potential for electrocatalytic oxidation of glucose with high sensitivity and selectivity. Cyclic voltammetry and square wave voltammetry studies suggest superior sensitivity and selectivity of Mn-NiO decorated carbon nanotubes towards the non-enzymatic determination of glucose. A linear response between the peak current and the concentration of glucose has been found to be in the concentration range of 0.01 µM- 10000 µM which suggests the potential efficacy of Mn-NiO decorated carbon nanotubes for sensitive determination of glucose.

Keywords : diabetes, glucose, Mn-NiO decorated carbon nanotubes, non-enzymatic
Conference Title : ICBST 2017 : International Conference on BioSensing Technology
Conference Location : Zurich, Switzerland
Conference Dates : January 13-14, 2017