Carbon Nanotubes based Microelectrode Fabrication for Enzymatic Detection of Biomolecules

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Abstract

Detection of biomolecules is important in disease diagnosis and treatment. Electrochemical enzymatic biosensors are tools that are used for real time detection of biomolecules. They are inexpensive, sensitive, and accurate. Carbon nanotubes (CNTs) are used in sensor development due to their fast electron transfer kinetics, increased peak current response, and high sensitivity. In this work, we report a three electrode system of microelectrodes fabricated by CNT used for biosensor development, optimization, and characterization. Highly densified carbon nanotube fiber (HD-CNTf) cross sections which embedded in an inert polymer matrix with exposed open ended CNTs at the interface used as the electrochemical surface for the detection of Glucose. HD-CNTf cross section (~40 µm diameter) modified as a working electrode with deposition of a redox mediator and immobilization of Glucose oxidase by drop casting method to detect Glucose. A HD-CNTf cross section (~80 µm diameter) was used as a counter and reference electrode; electrode surface was electroplated with Ag/AgCl and then coated with Nafion™ to work as quasi-reference electrode. Scanning Electron Microscopy (SEM) is used for morphological characterization and cyclic voltammetry and amperometric analysis are used as electrochemical detection methods. This developed microelectrode system is used with glucose detection under physiological pH and temperature.

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I am Nilni Esanka Weerawarna, a first year graduate student at the Department of Chemistry, University of Cincinnati, Ohio. I work as a graduate teaching assistant at the Department of Chemistry, University of Cincinnati. My research focuses on electroanalytical techniques for the detection of biomolecules and Dr. Noe Alvarez is my research advisor. I was able to become proficient in advanced instrumental techniques during my project. I was able to get awarded for excellent performance as a graduate teaching assistant 2022-2023 academic year.