Amperometric glucose biosensor based on conducting polymer nanotubes

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Statement of Purpose: Development of glucose biosensors is an intensely investigated research area due to the importance of these biosensors in treatment of diabetes mellitus (1). To date, the most common aperometric glucose biosensors use the specific recognition of glucose by the enzyme glucose oxidase (GOx). Achieving high sensitivity and longevity in these biosensors has, however, remained a challenge (2). Conducting polymers have attracted considerable attention in the fields of biosensors due to their suitable matrix for immobilization and entrapment of enzymes and their unique mechanism for direct electron transfer (3). Among different conducting polymers, poly(3,4-ehthylenedioxythiophene) (PEDOT) has been reported to exhibit superior chemical stability and high conductivity (4).

Methods: We have developed a novel method for fabrication of PEDOT nanotube-based glucose biosensor on the surface of platinum microelectrodes. Glucose oxidase (1000 unit/mL) was immobilized into the PEDOT nanotubes during the fabrication process. EDOT was polymerized on the platinum microelectrodes in glavanistatic mode with deposition charge density of 150 mC/cm^2 (I = 6.5 nA, t = 300 s).

Results: We have demonstrated that glucose could be detected at a low potential of 400mV versus Ag/AgCl instead of detection of hydrogen peroxide as a by-product at 700mV. The lower voltage applied in this approach may increase the activity and stability of the enzyme. Preliminary results of this work have shown the higher sensitivity ($5.7 \mu A.cm^{-2}.mM^{-1}$) and lower limit of detection (3µM) in comparison with control PEDOT film ($2.1 \mu A.cm^{-2}.mM^{-1}$ and 8µM respectively). We will investigate the enzyme activity and stability or the long–term performance of PEDOT nanotube-based glucose biosensors.

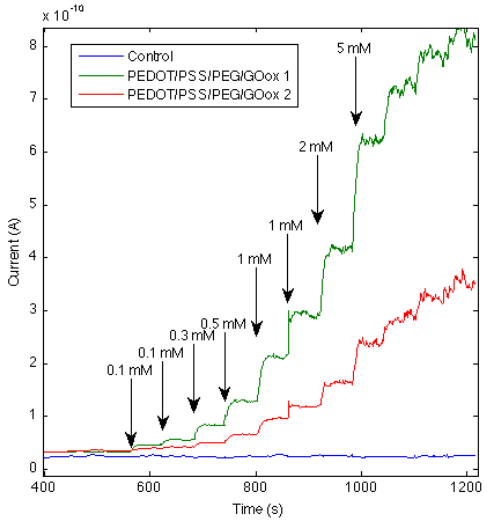

Figure 1

Conclusions: We believe this study paves the way for design and development of sensitive and selective neurochemical biosensors, aiming toward long-term *in vivo* measurements of neurochemicals. consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad.

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