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Development of amperometric glucose biosensor based on thienylpyrrole copolymers

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Over the last decade, numerous studies have been devoted to conducting polymers since they have been successfully employed in the fields of electrochromic displays, solar cells and biosensors. Among these polymers, poly(2,5-dithienylpyrrole) derivatives (PSNS) have received considerable attention because of their low oxidation potentials, ease in preparation and promising electrochromic properties. In particular, copolymerization of some 2,5-dithienylpyrrole (SNS) derivatives with 3,4-ethylenedioxythiophene (EDOT) led to an impressive set of electrochromic polymers having superior properties such as enhanced optic contrast, switching time, multichromism and effective band gap control. However, till now utilization of these copolymers in the field of amperometric biosensors was not considered. In here, we report construction of a new glucose oxidase based amperometric biosensor for determination of glucose in real samples. To prepare the biosensor, the copolymer was synthesized by potentiodynamic electrocopolymerization of 4-(2,5-di(thiophen-2-yl)-1H-pyrrol-1-yl)benzenamine) and EDOT between -0.5 and +1.2 V at a scan rate of 100 mV/s. The resultant copolymer film was modified with carbon nanotubes (CNTs) and glucose oxidase was immobilized with gluteraldehyde. The amperometric responses of the enzyme electrodes were measured by monitoring oxidation current of H_2O_2. The optimum pH and operation potential were found to be 7.0 and 0.6 V, respectively. A linear relation was observed in the range of 0.02–5.0 mM by using glucose as the substrate. The limit of detection and sensitivity of the sensor were estimated as 6.2 µM and 6.86 µAmM-1cm-2, respectively. The biosensor revealed good reproducibility standard deviation ±0.122, relative standard deviation %6.3 (n=25) and satisfactory life time 68 days.

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