Title : Fabrication of poly(aniline-co-3-aminobenzoic acid) electrospun nanofiber film for simultaneously electrochemical detection of dopamine and uric acid

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ABSTRACT

This research aimed to fabricate and investigate the electrochemical properties of poly(aniline-co-3-aminobenzoic acid) (PANI/PABA) electrospun nanofiber film for the simultaneously electrochemical detection of dopamine (DA) and uric acid (UA). The PANI/PABA was synthesized via chemical oxidative polymerization at molar ratios of aniline-to-3-aminobenzoic acid as 1:1, 1:2 and 2:1, using ammonium persulfate (APS) as the oxidizing agent. The nanofiber film of the synthesized copolymer were then prepared by electrospinning method onto a fluorine-doped tin oxide (FTO) coated glass substrate under controlled condition (an applied voltage of 15 kV, a solution flow rate of 1.0 mL/h, a solution volume of 5 mL, a needle-to-collector distance of 15 cm, and a spinning time of 15 minutes). Morphological analysis using scanning electron microscopy (SEM) revealed that the PANI/PABA nanofiber at 2:1 ratio exhibited clearer, more continuous, and more uniform fiber structures than those at ratios of 1:1 and 1:2, with an average fiber diameter of 87.228 nm. Structural characterization by attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy confirmed the copolymer formation through the presence of characteristic functional groups, including C–H, C=O, C=C, and C–N. Electrochemical properties were investigated using cyclic voltammetry (CV) in the potential range of −0.2 to 0.9 V at scan rates of 20, 40, 60, 80, 100, 200, 300, and 400 mV/s for two cycles in a phosphate buffer saline solution containing 5 mM $K_3Fe(CN)_6$ and 0.1 M KCl. The CV results clearly demonstrated that the electron transfer behavior at the electrode surface of the 2:1 ratio exhibited the highest current response, which indicated a good electrical conductivity. Furthermore, an application in electrochemical sensing using differential pulse voltammetry (DPV) showed that the fabricated electrospun nanofiber film of the synthesized PANI/PABA provided high specificity and effectively simultaneous detection of DA and UA.

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