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Comparative study of poly(4-vinylpyridine) and polylactic acid-block-poly(2-vinylpyridine) nanocomposites on structural, morphological and electrochemical properties (Article)

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Abstract

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Polymer-based nanocomposites have attracted a lot of attention for amperometric biosensor development due to their general physical and chemical properties including biocompatibility, film-forming ability, stability and different functional groups that can be bonded with other biomolecues. In this study, poly-4-vinlyridine homopolymer (P4VP) and polylactic acid-block-poly(2-vinylpyridine) block copolymer (PLA-b-P2VP) were used to hybridize with gold precursors (Au3+) based on the association between the nitrogen of the pyridine group of P4VP or P2VP block with gold precursors. P4VP/Au3+ and PLA-b-P2VP/Au3+ nanocomposites were prepared with ratio of gold to P2VP or P4VP (10:1). The Au3+ in both polymers was reduced to gold nanoparticles (AuNPs) via in-situ approach by using hydrazine. Fourier transform infrared spectroscopy (FTIR), ultraviolet-visible spectroscopy (UV-vis), transmission electron microscopy (TEM) and cyclic voltammetry (CV) were used to characterize the structural, morphological and electrochemical properties of the nanocomposites. The peak currents of P4VP/AuNPs and PLA-b-P2VP/AuNPs nanocomposites modified electrode were 6.685 nA and 69.432 nA, respectively, which are much lower than bare electrode (205.019 nA) due to the non-conductivity of P4VP and PLA-b-P2VP. In order to improve the electron transfer capability of electrode, graphene oxide (GO) was blended and electrochemically reduced to obtain P4VP/AuNPs/rGO and PLA-b-P2VP/AuNPs/rGO nanocomposites. After immobilization of these two nanocomposites on electrode through drop casting method, the peak currents of P4VP/AuNPs/rGO and PLA-b-P2VP/AuNPs/rGO nanocomposites modified electrode were 871.172 nA and 663.947 nA, respectively, which are much higher than bare electrode (205.019 nA) and shown good capability to accelerate electron transfer. Based on these characterizations, P4VP/AuNPs/rGO has potential as the

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View Compounds

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