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Synthesis of grapheme oxide grafted poly(lactic acid) with palladium nanoparticles and its application to serotonin sensing

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Abstract

Graphene oxide (GO) has treated with methylene diphenyl diisocyanate (MDI) and subsequent 1,4-butanediol (BD) to create an anchoring OH site on the surface of GO (GO-MDI-OH). The OH groups of GO-MDI-OH were the initiators of the polymerization of poly(lactic acid) (PLA). The subsequent GO-*g*-PLA was synthesized by the polymerization reaction in the presence of GO-MDI-OH and PLA. The synthesized materials were characterized via ^{1}H-NMR, Fourier transform infrared spectroscopy (FT-IR), Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), thermal analysis (differential scanning calorimeter (DSC), and thermogravimetric analysis (TGA)). The surface morphologies and degree of dispersions at G-*g*-PLA··metals were observed using a field emission scanning electron microscope (FE-SEM) and a transmission electron microscopy (TEM). The electrical conductivity of G-*g*-PLA-Pd was largely enhanced compared with those of GO and GO-*g*-PLA. G-*g*-PLA-Pd was used for the electrochemical detection of serotonin. Electrocatalytic activities were verified from the cyclic voltammetry (CV) and amperometric response in a 0.1M phosphate buffer solution (PBS). A significantly higher concentration range (0.1~100.0 μM) and a lower detection limit (8.0×10^{-8} M, where s/n=3) were found at the G-*g*-PLA-Pd modified glassy carbon electrode (GCE).