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Fabrication of graphene/polyaniline composite multilayer films by electrostatic layer-by-layer assembly

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Abstract:

A novel graphene/polyaniline composite multilayer film was fabricated by electrostatic interactions induced layer-by-layer self-assembly technique, using water dispersible and negatively charged chemically converted graphene (CCG) and positively charged polyaniline (PANI) as building blocks. CCG was achieved through partly reduced graphene oxide, which remained carboxyl group on its surface. The remaining carboxyl groups not only retain the dispersibility of CCG, but also allow the growth of the multilayer films via electrostatic interactions between graphene and PANI. The structure and morphology of the obtained CCG/PANI multilayer film are characterized by attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy, Ultraviolet-visible absorption spectrum (UV-vis), scanning electron microscopy (SEM), Raman spectroscopy and X-Ray Diffraction (XRD). The electrochemical properties of the resulting film are studied using cyclic voltammetry (CV), which showed that the resulting CCG/PANI multilayer film kept electroactivity in neutral solution and showed outstanding cyclic stability up to 100 cycles. Furthermore, the composite film exhibited good electrocatalytic ability toward ascorbic acid (AA) with a linear response from 1×10^{-4} M to 1.2×10^{-3} M with the detect limit of 5×10^{-6} M. This study provides a facile and effective strategy to fabricate graphene/PANI nanocomposite film with good electrochemical property, which may find potential applications in electronic devices such as electrochemical sensor.