Synthesis and characterization of nanocomposites based on polyaniline-gold/graphene nanosheets

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Abstract

Polymer nanocomposites (NSPANI-AuNP-GR) based on nanostructured polyaniline (NSPANI), gold nanoparticles (AuNP) and graphene nanosheets (GR) have been synthesized using in situ polymerization. A series of nanocomposites have been synthesized by varying the concentration of GR and chloroauric acid to optimize the formulation with respect to the electrochemical activities. Out of these series of NSPANI-AuNP-GR composites, it has been found that only one particular composite has the best electrochemical properties, as analyzed by Cyclic Voltammetry (CV) and differential pulse voltammetry (DPV) and conductivity. The best nanocomposite has been characterized by Fourier transform Raman spectroscopy (FT-Raman), UV-Vis spectroscopy, X-Ray diffraction (XRD) studies, Transmission electron microscopy (TEM), Scanning electron microscopy (SEM) and Atomic force microscopy (AFM). The CV of the best composite shows the well-defined reversible redox peaks characteristic of polyaniline, confirming that the polymer maintains its electro activity in the nanocomposites. Another nanocomposite has been prepared with identical composition (as found with the best nanocomposite) by mixing of pre-synthesized nanostructured polyaniline with chloroauric acid and graphene dispersion to order to predict the mechanism of in situ polymerization. It is inferred that the composite prepared by blending technique losses its property within 48 h indicating phase separation whereas the nanocomposite prepared by in situ technique are highly stable.

Keywords: Polyaniline, nanocomposite, graphene nanosheets, gold nanoparticles, electrochemical properties.