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Electrochemical performance and material characterization of synthesized graphene/silver nanocomposite

Abstract

Few layered graphene has more platelet-like structures. This causes more stacking and aggregation of graphene sheets. Silver nanoparticles are intercalated between these sheets. Silver nanoparticles are able to tailor the physical and electrochemical properties of graphene. The graphene/silver nanoparticle composite is synthesized using a high-temperature solid-state synthesis technique with tartaric acid as the activating agent. The nanocomposite is characterized by XRD, UV–visible analysis, FTIR, SEM, and cyclic voltammetry. The formation of the graphene/silver nanocomposite is confirmed by the XRD spectrum. Peaks at 290 and 450 nm in the UV–visible spectrum of the graphene/silver nanocomposite indicate the plasmonic properties of both constituent materials. The intercalation of spherical particles in between the two-dimensional sheets is clearly observed from SEM images. The silver nanoparticles are well-intercalated within the graphene matrix and exhibit excellent electrochemical performance. The electrochemical measurements confirm the feasibility of the obtained nanocomposite to fabricate the electrodes for energy storage devices. The cyclic voltammetry (CV) and galvanostatic charge–discharge (GCD), electrochemical impedance spectroscopy (EIS), and the cyclic stability are obtained through the electrochemical test. The highest specific capacitance obtained for graphene/silver composite is 851.68 F/g.

Keywords

Electrochemical performance; Graphene; Nanocomposite; Silver nanoparticles