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Production and Characterization of Metal Oxide Loaded Reduced Graphene Oxide Nanocomposites

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Extended Abstract

Graphene-based nanocomposite structures have recently attracted considerable attention as advanced materials due to excellent properties of graphene. Graphene plays an important role as a conducting flexible substrate to host active nanomaterials especially for energy applications with its two-dimensional carbon structure [1]. Outstanding materials produced with reduced graphene oxide (rGO) by loading metal oxide nanoparticles are especially used as electrodes for Li-ion batteries. As known, Li-ion batteries are one of the most important energy storage devices due to its high energy density, high power density, long cycle life and environmental friendliness [2]. Compared to other battery types, Li-ion batteries are currently used in many devices such as portable electronics, laptop computers and cellular phones due to their higher energy density [3]. SiO_2 has been considered as one of the promising materials thanks to its low discharge potentials, abundancy and low cost [4]. Also, ZnO is a promising anode material for lithium ion batteries due to its high theoretical capacity, which is nearly three times that of the currently used graphite anode [5].

In this work, for Li-ion batteries, ZnO-SiO_2-reduced graphene oxide (rGO) nanocomposite was produced as anode material. Firstly, graphite oxide was produced from graphite via Hummer's method. Then, SiO_2 and ZnO nanoparticles were added to aqueous graphite oxide suspension and ultrasonicated for 1 hour. Afterwards, via vacuum filtration, this suspension was filtrated, and reduction process was applied in hydrazine solution. Consequently, free-standing ZnO-SiO_2-rGO nanocomposite papers were obtained. Produced nanocomposites were characterized by field emission scanning electron microscopy (FESEM), energy dispersive X-ray spectrometer (EDS) and X-ray diffraction (XRD) analyses. Optical properties of ZnO-SiO_2-rGO nanocomposites were investigated via Fourier transform infrared spectroscopy (FT-IR).

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