Impact of PVP Concentration on Zinc Oxide Semiconductor Nanostructures Prepared by Thermal Treatment Method

Naif Mohammed Al-Hada1, Elias B. Saion1, Abdul H. Shaari, Mazliana A. Kamarudin, Maharaz M. Nasir
Physics Department, Faculty of Science, UPM, 43300 Serdang Selangor, Malaysia
Corresponding author: naifalhada@yahoo.com

ABSTRACT

Nanocrystalline ZnO were synthesized by using a simple thermal treatment technique. Polymers, namely, polyvinyl pyrrolidone (PVP), were used as capping agents. The samples were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). The X-ray diffraction pattern revealed the formation of phase-pure ZnO nanopowders. It is observed that the polymers play an important role in modifying the surface morphology and the size of the crystallites. A compact granular morphology is observed for the ZnO samples without polyvinyl pyrrolidone. The samples exhibit nanoparticles of size less than 100 nm for PVP. FTIR study is used to confirm the structural modifications occurring in the polymers.

Improved Photocatalytic Activity of Anatase Titanium Dioxide by Reduced Graphene Oxide

Nor Shuhada Alim1, Hendrik O. Lintang2, Leny Yuliati2*
1 Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia
2 Centre for Sustainable Nanomaterials, Ibnu Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia
*Corresponding author: leny@ibnusina.utm.my

ABSTRACT

Reduced graphene oxide (rGO) has been one of the most investigated carbon based materials due to its great electronic conductivity that make it able to accept and transport electron easily. In order to study the effect of rGO, anatase titanium dioxide-reduced graphene oxide (TiO2-rGO) composite was prepared by UV-assisted photocatalytic reduction method using the anatase TiO2 as a photocatalyst and various different loadings of graphene oxide (GO). The characterizations of the prepared samples were investigated by X-ray diffractometer (XRD), Fourier transform infrared (FTIR), and fluorescence spectroscopies. The XRD patterns and FTIR spectra confirmed that all the TiO2-rGO composites samples were successfully synthesized without disrupting the structure of the anatase TiO2. Fluorescence spectroscopy revealed the role of the rGO to reduce the electron-hole recombination on the anatase TiO2. In the photocatalytic removal of phenol, all the TiO2-rGO composites showed better photocatalytic activities than the bare anatase TiO2 under UV light irradiation. The activity of the anatase TiO2 was enhanced by more than four times with the addition of the GO with the optimum amount (3 wt%). It was proposed that the good photocatalytic performance obtained on the composites were caused by the successful suppression of electron-hole recombination by the rGO on the TiO2.

---

| Zinc oxide nanoparticles | Polyvinyl pyrrolidone | Thermal treatment method |

| Anatase titanium dioxide | Reduced graphene oxide | Titanium dioxide-reduced graphene oxide composite | Photocatalyst | Removal of phenol |