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

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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.

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

Improved Photocatalytic Activity of Anatase Titanium Dioxide by Reduced Graphene Oxide

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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 (TiO_2-rGO) composite was prepared by UV-assisted photocatalytic reduction method using the anatase TiO_2 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 TiO_2-rGO composites samples were successfully synthesized without disrupting the structure of the anatase TiO_2. Fluorescence spectroscopy revealed the role of the rGO to reduce the electron-hole recombination on the anatase TiO_2. In the photocatalytic removal of phenol, all the TiO_2-rGO composites showed better photocatalytic activities than the bare anatase TiO_2 under UV light irradiation. The activity of the anatase TiO_2 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 TiO_2.

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