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Characterization and Photocatalytic effect of ZnO nanoparticles synthesized by spray-pyrolysis method

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ZnO shows a direct band gap of 3.37eV, large exciton binding energy (~60 meV), high oxidation ability, high sensitivity to many gases, and low cost, and it has been used in various applications such as transparent electrodes, light emitting diodes (LEDs), gas sensors and photocatalysts. Among these applications ZnO as photocatalyst has considerably attracted attention over the past few years because of its high activities in removing organic contaminants generated from industrial activities. In this research, ZnO nanoparticles were synthesized by spray-pyrolysis method using the zinc acetate dihydrate as starting material at synthesis temperature of 900℃ with concentration varied from 0.01 to 1.0M. The physical and chemical properties of the synthesized ZnO nanoparticles were examined by X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Fourier Transformation Infrared (FT-IR), and UV-vis spectroscopy. The Miller indices of XRD patterns indicate that the synthesized ZnO nanoparticles showed a hexagonal wurtzite structure. With increased precursor concentration, a primary, secondary particle sizes of ZnO nanoparticles increased by 0.8 to 1.5μm and 15 to 35nm, and their crystallinity was improved.

Methyleneblue (MB) solution (1μM) as a test comtaminant was prepared for evaluating the photocatalytic activities of ZnO nanoparticles synthesized in different precursor concentration. The results show that the photocatalytic efficiency of ZnO nanoparticles was gradually enhanced by increased precursor concentration.