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SYNTHESIS OF ZnO NANO-PARTICLES AND THEIR APPLICATION FOR PHOTO-CATALYTIC REMOVAL OF DYE UNDER UV AND SOLAR ENERGY IRRADIATION

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Abstract

The present work was aimed to produce ZnO nanoparticles through a simple synthesis technique (sol-gel method). The Fourier transforms infrared (FTIR), and Electron microscopic (SEM-EDX) results have shown high purity of the ZnO and they are consistent with the one obtained from X-ray diffraction (XRD). The analyzes by Transmission electron microscopy (TEM) show that the ZnO nanoparticles are mainly spherical. The ZnO nanoparticles were applied as a catalyst for the photocatalytic decolorization of Cresol Red (CR). The average crystal size was calculated by using the powder X-ray and was found to be 47 nm and the specific surface area was about 104.5 m²/g. In the first stage, the photolysis of CR under UV irradiation was negligible. During the second stage, the photocatalytic degradation of CR was studied using UV or solar irradiation. Besides, several parameters were investigated like: pH, initial dye concentration, light effect, and alcohol effect. The obtained results showed that the percentage of decolorization decreases with an increasing initial concentration of dye. We observed also that photocatalytic efficiency (in sunlight) was about 94.1% in 30 min, whereas in UV irradiation it was about 78.5%. The photocatalytic degradation of CR on ZnO was found favorable at free pH. The effect of alcohol showed that there-butanol inhibited at the amount of 35.4%. A TOC removal in the range of 68.5% was achieved after 240 minutes.

Key words: dye, mineralization, photocatalytic, solar energy, ZnO nanoparticles

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