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PHOTOCATALYTIC DEGRADATION EFFECT OF RHODAMINE B DYES ON CERIUM OXIDE DOPED ZINC OXIDE PARTICLES UNDER VISIBLE LIGHT IRRADIATION

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Abstract

In this study, un-doped ZnO and Zn_{1-x}Ce_xO (x = 0.01, 0.03, 0.05 and 0.10% wt) particles surface, structural, optical, morphological and photocatalytic activities were investigated. Un-doped ZnO and Ce-doped ZnO nanoparticles were synthesized via the sol-gel synthesis method. The crystal structure and possible impurities of the obtained nanoparticles were analyzed by X-Ray diffractometry (XRD). It has an X-ray diffraction pattern in which all dust particles match ZnO in the wurtzite structure, the range of average crystallite size 33 - 49 nm. Surface morphology and particle size were characterized by SEM analysis. Compared to undoped ZnO, the bandgap of Ce-doped ZnO is less and this depends on the proportion of doped. The forbidden bandgap energy (E_g) measurement result is between 3.07 eV and 2.94 eV with % Ce doped to ZnO. Rate constant value (k⁻¹) was determined for Ce-doped ZnO at 0.01, 0.03, 0.05 and 0.10%, respectively. Results showed that the k⁻¹ value at un-doped ZnO doped is 0.00801 ± 0.00243 min⁻¹. In contrast, k significantly increased to 0.01719 ± 0.00286 by 1% Ce doped in the ZnO matrix. The effect of the synthesized nanoparticles on the dye under visible light was investigated using Rhodamine B (RhB) dye. All results showed that 1% Ce-doped ZnO has the highest photoactivity (96.67%) among all samples.

Keywords: Ce doping ZnO, photocatalyst, Rhodamine B dye

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