Preparation of Highly Active Zinc Oxide for Photocatalytic Removal of Phenol: Direct Calcination versus Co-Precipitation Method

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ABSTRACT

Photocatalytic removal of phenol under UV light irradiation was studied on zinc oxide (ZnO) photocatalysts, which were prepared via direct calcination (DC), and co-precipitation (CP) methods. The XRD patterns revealed that all the prepared ZnO samples showed wurtzite structure, in which the ZnO-CP showed higher intensity of the diffraction peaks than the ZnO-DC sample. Optical and fluorescence properties of the prepared ZnO samples were similar to each other as confirmed by DR UV-Vis and fluorescence spectroscopies, respectively. The Stern-Volmer plot was investigated to study the interactions between the emission sites and the phenol. It was obtained that the emission sites of the ZnO-CP gave better interactions towards phenol molecules as compared to the ZnO-DC. After 6 hours reaction under UV light irradiation, the ZnO-CP sample showed 2 times higher photocatalytic activity for removal of phenol (10%) than that of the ZnO-DC (5%). It was suggested that the high activity observed on the ZnO-CP sample would be due to high crystallinity and good interactions with phenol. These results clearly suggested that the co-precipitation method was a good approach to prepare the highly active ZnO for the photocatalytic removal of phenol.

| ZnO | Co-precipitation | UV-light irradiation | Phenol | Photocatalyst |

Correlation of Fluorescence and Photocatalytic Activity of Co-Doped TiO_2

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ABSTRACT

Co-doped TiO_2 (0.5-4 mol%) photocatalysts were synthesized via sol-gel method and their physical and chemical properties were investigated. Addition of Co oxides dopants induced anatase to rutile phase transition and reduced the band gap energy of TiO_2. The fluorescence result indicated that the electron-hole recombination rate was reduced with the presence of Co oxides dopant. The best photocatalyst obtained was 3Co-TiO_2 which enhanced the photocatalytic activity of TiO_2 by 10 folds to 26.6%. The importance of fluorescence properties of Co-doped TiO_2 towards its photodegradation of Congo Red was presented.

| Fluorescence | Photocatalyst | Co-doped titania |