Synthesis, characterization, and application of ZnO/TiO₂ nanocomposite for photocatalysis of a herbicide (Bentazon)

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ABSTRACT

The purpose of this investigation was to study the applicability of ZnO–TiO₂ composite as a photocatalyst for degradation of Bentazon. Effects of various parameters such as catalyst dosage, pH, initial Bentazon concentration, oxygen purging gas, hydrogen peroxide concentration and type of organic compounds on the removal efficiency of Bentazon were studied. The results of SEM and FT-IR analysis demonstrated favorable immobilization of zinc oxide nanoparticles onto TiO₂. The greatest removal of Bentazon was observed at neutral pH due to photo-corrosion of ZnO on composite in acidic and basic conditions. The pseudo-first-order rate constant (kobs) and electrical energy per order (Eeo) were greatly dependent on the Bentazon concentration. Removal efficiency of Bentazon was increased with O₂ purging and addition of H₂O₂, while it was decreased in the presence of organic compounds. Removal efficiency of Bentazon by UV/ZnO/TiO₂ process was greater than that by UV/TiO₂ process, UV/ZnO, and UV alone. Photocatalytic activity was maintained even after five successive cycles.

Keywords: Photocatalysis; Bentazon; Nanocomposite; Zinc oxide/titanium oxide

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