

RECENT PROGRESS ON FABRICATION OF ZnO/BIO MASS COMPOSITE FOR THE ABATEMENT OF ORGANIC POLLUTANTS IN WATER/WASTEWATER TREATMENT

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Abstract

The application of composites made of zinc oxide (ZnO) and biomass as photocatalysts (ZnBPs) has emerged as an efficient and eco-friendly alternative class of destructive treatment technique applied for degradation of organic pollutants. Among the semiconductors traditionally used in heterogeneous photocatalysis, ZnO has shown satisfactory attributes, which includes mechanical-thermal stability, low cost, non-toxicity, and a wide direct band gap (3.37 eV), absorbing UV irradiation, but limited in the visible region. Fast electron/hole pair recombination rate is also one of the ZnO main drawbacks. Coupling adsorption with photocatalysis to develop ZnBPs is a promising strategy to remove organic pollutants due to the synergistic effect. Waste biomass derived materials can provide multiple function groups, which can enrich organic pollutants onto the surface of the photocatalysts thus facilitating the following transformation mediated by ZnO. Biomass can also help the recovery of ZnBPs and even increases the absorption of sunlight irradiation spectrum. In the present work, a review of the recent progress of ZnBPs preparation methods as well as synergistic effects of adsorptive and photocatalytic activities for organic pollutants removal in water was addressed. The literature survey was limited to peer-reviewed publications written in English between 2010 until August 2020. In total, 20 articles were selected based on their focus on composite preparation methods, characterization and material performance. The fabrication of ZnBPs is discussed in detail and two categories of methods were considered to prepare ZnBPs: (i) one-step synthesis and (ii) two-step synthesis. A considerable enhancement in the capacity for photocatalytic degradation of organic pollutants was obtained with ZnBPs application compared to control, especially for organic dyes. The characteristics of the ZnBPs are presented and the impacts on adsorption and photocatalytic efficiency performance is addressed. Projections and perspectives for realistic applications of these materials were outlined.

Keywords: Waste biomass; ZnO; composite photocatalysts; organic pollutants; wastewater