



Heterostructured Ti-doped ZnO/Ag metal: an efficient photocatalyst for dye degradation in sunlight

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ABSTRACT

Silver metal/Ti-doped ZnO, silver metal/ZnO, Ti(IV)-doped ZnO and ZnO photocatalysts were obtained by thermal decomposition of respective oxalate precursors. The synthesized photocatalysts were characterized by chemical and spectroscopic methods. The doping of ZnO with Ti(IV) and the formation of silver metal heterostructures in ZnO nanostructures were confirmed through powder X-ray diffraction and tunneling electron microscopy analysis. The ZnO and Ti-doped ZnO have crystallized in hexagonal wurtzite structure while heterostructured catalysts showed the presence of additional cubic crystalline phase belonging to Ag metal. Surface morphology was observed through scanning electron microscopic imaging while surface area was determined by Brunauer–Emmett–Teller method. The photocatalytic activity of the photocatalysts was studied on the structurally diverse dyes in the sunlight and under optimized conditions of pH of dye solutions and catalyst dose. The degradation of dyes was measured in terms of decolourization as well as chemical oxygen demand. The photocatalytic activities of the catalysts were compared in terms of first-order rate constants of the decolourization of dyes. The photocatalytic activity of the heterostructured Ag metal/Ti-doped ZnO catalysts was found superior to the photocatalytic activity of ZnO, silver metal/ZnO and Ti-doped ZnO catalysts.

Keywords: ZnO; Photocatalyst; Heterostructure; Dye degradation; Sunlight

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