



PREPARATION OF NANOSIZED BISMUTH TUNGSTATE AND ITS PHOTOCATALYTIC ACTIVITY

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ABSTRACT

Many heterogeneous photocatalysts for environmental applications such as air pollution, water treatment, for hydrogen evolution from aqueous solution etc. are developed in recent years. The aim of the present work was to improve the synthesis method of bismuth tungstate (Bi_2WO_6) and evaluation of photocatalytic activities of product under UV irradiation by changing the degree of crystallinity of bismuth tungstate.

Bi_2WO_6 nanopowders have been prepared with wet chemical method – combustion method by using several organic additives. The bismuth nitrate solution was mixed with tungstic acid and definite amounts of glycine, ethylene glycol, citric acid or glycerine and HNO_3 were added. The reactants were stirred and heated in air for 2 - 4 h up to 350°C until burning of the formed xerogel was started. As-prepared crystalline powder, besides Bi_2WO_6 depending on reaction conditions and used organic fuel contained some admixture phases – WO_3 , $\text{Bi}_2\text{W}_2\text{O}_9$, $\text{Bi}_{14}\text{W}_2\text{O}_{27}$ and $\text{Bi}_{14}\text{WO}_{24}$. Additional calcination at $650 - 800^\circ\text{C}$ high temperature leaded to formation of the pure crystalline Bi_2WO_6 . The calcinated bismuth tungstate nanopowders have high crystallinity and specific surface area (BET) in the range of $12 - 23 \text{ m}^2/\text{g}$ depending on used fuel and calcinations temperature.

The photocatalytic activity of Bi_2WO_6 nanoparticles was determined by degradation of methylene blue (MB) solution under ultraviolet illumination. MB decomposition proceed as first order reaction and using MS Excel Solver, the kinetic rate constant was calculated for bismuth tungstate with different crystallinty and specific surface area. The degradation of MB strongly depended on crystallinity and specific surface area (BET). The Bi_2WO_6 nanoparticles with specific surface area $23,4 \text{ m}^2/\text{g}$ and $13,3 \text{ m}^2/\text{g}$ ensured 93% and 74 % degradation of MB during 3 hours respectively.

Keywords: bismuth tungstate, photocatalysis