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First page example

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Synthesis and Characterization of Attapulgite Clay Coated Ag/AgBr/TiO_2 Visible Light Photocatalyst

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Abstract: Attapulgite clay coated Ag/AgBr/TiO_2 visible light photocatalyst was prepared by an impregnation-deposition-precipitation method. The catalyst was characterized via powder X-ray diffraction (XRD), TEM, UV-Vis spectroscopy, and EMAX, and their photocatalytic activity was examined by degradation of methylene blue in water under sunlight. The results showed that the catalyst exhibited high efficiency for the degradation of methylene blue and the catalyst activity maintained effectively after successive cyclic experiments under sunlight, attributed to adsorption of dye on attapulgite clay and high dispersion of AgBr and TiO_2 nano-sized particles on the surface of attapulgite clay.

1. Introduction

TiO_2 photocatalysis has been attracted wide attention for the degradation of different pollutants and the destruction of bacteria [1]. However, the main drawback of low quantum yield and the lack of visible light utilization hinder its practical application. To solve these problems, many methods were used to enhance the photocatalytic efficiency and visible-light utilization of TiO_2, which include impurity doping [2-4], metallization [5,6], and sensitization [7]. Ag/AgBr/TiO_2 photocatalyst prepared by coating AgBr on the P-25 TiO_2 exhibits excellent visible-light photocatalytic activity for the destruction of azodyes and bacteria [8]. To save expensive raw materials, photocatalyst were usually loaded on the surface of porous supports. Those supported photocatalysts remain high photocatalytic efficiency for the high dispersion of catalyst particles and high adsorption properties of the supports. So, Elahifard et al [9] prepared apatite coated Ag/AgBr/TiO_2 visible light photocatalyst through the deposition of TiO_2 on hydroxyapatite, followed by the decoration of AgBr, which also has a significantly high photocatalytic activity under visible light. In these photocatalysts [8, 9], AgBr is the visible light component of the photocatalyst and Ag^0 prepared on the surface of AgBr under visible light enhance the electron-hole separation and interfacial charge transfer.

Attapulgite (ATP, or palygorskite) clay is an cheap natural clay and has been used to remove organic pollutants in water for their excellent adsorption properties [10, 11]. There has been reported that Ag-PG/TiO_2 photocatalyst prepared by coating TiO_2 nanoparticles on the surface of palygorskite clay modified by silver ions has high degradation efficiency for methylene blue under UV light [12]. Zhang et al [13] prepared attapulgite-SnO_2-TiO_2 composite photocatalyst after deposition and calcination of SnO_2 and TiO_2 precursors, which exhibits high photocatalytic activity for degradation of methyl orange under ultraviolet radiation.

In this paper, we prepared Ag/AgBr/TiO_2/ATP composite photocatalyst after deposition TiO_2 and