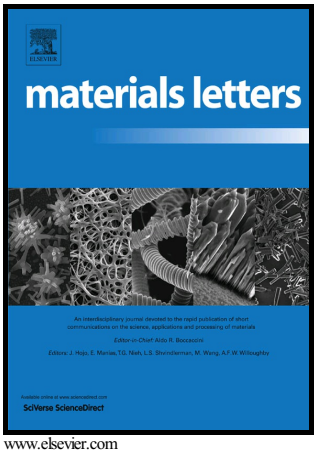

Graphene-decorated 3D $BiVO_4$ photocatalysts with controlled size and shape for efficient visible-light-induced photocatalytic performance

Man Ou, Qin Zhong, Yanxiao Zhao, Yuxiang Xue, Fujiao Song

PII: S0167-577X(16)31303-9
DOI: http://dx.doi.org/10.1016/j.matlet.2016.08.025
Reference: MLBLUE21309

To appear in: *Materials Letters*

Received date: 2 May 2016
Revised date: 20 July 2016
Accepted date: 6 August 2016

Cite this article as: Man Ou, Qin Zhong, Yanxiao Zhao, Yuxiang Xue and Fujiac Song, Graphene-decorated 3D $BiVO_4$ photocatalysts with controlled size an shape for efficient visible-light-induced photocatalytic performance, *Material Letters,* http://dx.doi.org/10.1016/j.matlet.2016.08.025

Graphene-decorated 3D $BiVO_4$ photocatalysts with controlled size and shape for efficient visible-light-induced photocatalytic performance

Man Ou[a,b], Qin Zhong[a,b]*, Yanxiao Zhao[a,b], Yuxiang Xue[a,b], Fujiao Song[a,b]

[a]School of Chemical Engineering, Nanjing University of Science and Technology, Nanjing, Jiangsu 210094, P.R. of China

[b]Nanjing AIREP Environmental Protection Technology Co., Ltd, Nanjing, Jiangsu 210091, P.R. of China

*Corresponding author: Qin Zhong, Email: zq304@mail.njust.edu.cn. Tel/Fax number: +86 25 84315517.

Abstract

Graphene decorated 3D double-layer half-open flower $BiVO_4$ composite (BVO-GS) was prepared via a facile solvothermal route. It was found that the size of the 3D $BiVO_4$ could be reduced from 4.5 μm to 2 μm with the addition of graphene oxide (GO). And the transportation and separation of the photo-generated electrons-holes were also significantly improved. Photocatalytic performances of $BiVO_4$ and BVO-GS have been evaluated by removing gaseous NO and RhB in liquid under visible light (VL) irradiation, where BVO-GS sample displayed enhanced photoactivity. The conversion of NO (~ 400 ppm) was about 60% and the RhB degradation ratio was about 90% for BVO-GS under VL irradiation. The boosted performance was attributed to the synthesized effect of size, shape and high photo-generated electrons-holes. The present study reveals that the role of graphene is not only a capping agent to controlling the size, but also a catalyst promoter for the photocatalytic performance.

Keywords: graphene, $BiVO_4$, photoactivity, size

1. Introduction

Photocatalysis is a promising green technology that is involved to solve the energy crisis and environmental remediation [1-4]. Monoclinic $BiVO_4$ (m-BVO) has received considerable attention due to its relatively narrow band gap (~ 2.4 eV), effective photocatalytic activity and good stability against photo-corrosion under VL irradiation [5]. It is well known that the photocatalytic performance over semiconductors is strongly dependent on their physical and chemical properties, such as size, morphology and efficient migration of photo-generated electron-hole pairs [6-11]. Latest efforts have been made to achieve that small size, three-dimensional (3D) morphology or efficient separation of photo-generated electrons-holes of m-BVO is conductive to improve the photoactivity, respectively [12-14]. However, the