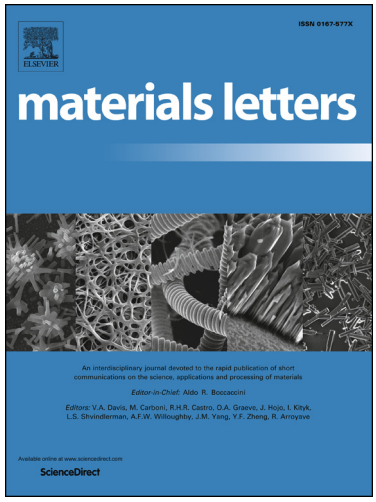
Accepted Manuscript



TiO_2 Hollow Nanofibers Grafted Ag/AgCl with More AgCl {111} Facet for Enhanced Photocatalytic Activity

Yuxian Xu, Daifeng Lin, Xinping Liu, Yongjin Luo, Hun Xue, Baoquan Huang, Qingrong Qian, Qinghua Chen

PII: S0167-577X(17)31866-9
DOI: https://doi.org/10.1016/j.matlet.2017.12.100
Reference: MLBLUE 23598

To appear in: *Materials Letters*

Received Date: 23 October 2017
Revised Date: 12 December 2017
Accepted Date: 22 December 2017

Please cite this article as: Y. Xu, D. Lin, X. Liu, Y. Luo, H. Xue, B. Huang, Q. Qian, Q. Chen, TiO_2 Hollow Nanofibers Grafted Ag/AgCl with More AgCl {111} Facet for Enhanced Photocatalytic Activity, *Materials Letters* (2017), doi: https://doi.org/10.1016/j.matlet.2017.12.100

TiO_2 Hollow Nanofibers Grafted Ag/AgCl with More AgCl {111} Facet for Enhanced Photocatalytic Activity

Yuxian Xu, Daifeng Lin, Xinping Liu, Yongjin Luo*, Hun Xue, Baoquan Huang, Qingrong Qian, and Qinghua Chen*

Fujian Key Laboratory of Pollution Control & Resource Reuse,
College of Environment Science and Engineering, Fujian Normal University,
Fuzhou, Fujian 350007, China

Abstract

Ag/AgCl composite as an alternative visible-light photocatalyst has attracted extensive interests; however, the high charge carrier recombination rate and short-term photocatalytic durability limit their practical application. In the present work, TiO_2 hollow nanofibers ($ELTiO_2$) grafted Ag/AgCl is fabricated via electrospinning-precipitation method. Compared with Ag/AgCl and Ag/AgCl-$SGTiO_2$ (sol-gel synthetized TiO_2), 2.89 and 1.59-fold enhancement in the photodegradation rate toward MO is observed over Ag/AgCl-$ELTiO_2$ under visible light irradiation. The enhancement of photocatalytic activity is mainly attributed to the higher content of the exposed AgCl {111} facet, which is beneficial for the separation of photogenerated carriers and accounts for more active sites. Moreover, Ag/AgCl-$ELTiO_2$ shows better photostability than bare Ag/AgCl.

Keywords: semiconductors; solar energy materials; Ag/AgCl; facet; TiO_2 hollow nanofiber; photocatalysis.

1. Introduction

Semiconductor photocatalysis offers great potential opportunities to deal with environmental contamination and energy crisis problems by utilizing free and renewable sunlight [1]. In order to utilize solar light effectively, plasmonic materials (Ag/AgCl catalysts) as promising visible-light photocatalysts have attracted tremendous attention. However, Ag/AgCl catalysts have a strong tendency to agglomerate into larger particles [2], which causes a decreased surface area and high charge carrier recombination rate [3]. The drawbacks further result in the decrease of their photocatalytic performance. Meanwhile, achieving a long-term photocatalytic durability is still a big challenge for Ag/AgCl [4].

To improve the photocatalytic activity of Ag/AgCl, combining a suitable semiconductor is an effective strategy. For example, Ag/AgCl/graphene sheets hybrid [3], Ag/AgCl/BiOCl [4] and AgCl@Ag@TiO_2 [5] all exhibit enhanced photocatalytic activities and higher stability for the degradation of organic pollutants than bare semiconductors. In addition, faceting photocatalysts has attracted increasing interest to improve photocatalytic activity. Cubic AgCl crystals mainly expose the low surface

* Corresponding authors. Tel. & Fax: +86-591 8346 5158

yongjinluo@fjnu.edu.cn (Y. Luo), cqhuar@fjnu.edu.cn (Q. Chen)