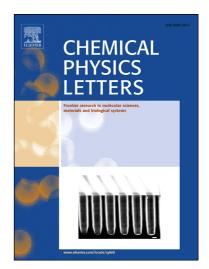
Accepted Manuscript

Research paper

Gas sensitivity and photocatalytic performance of cuprous oxide with novel morphologies

Ling Wu, Yulin Wu, Saijia Jin, Lun Zhang, Zhipeng Xun

| PII: | S0009-2614(16)30664-9 |
|----------------|--|
| DOI: | http://dx.doi.org/10.1016/j.cplett.2016.09.008 |
| Reference: | CPLETT 34149 |
| To appear in: | Chemical Physics Letters |
| Received Date: | 8 July 2016 |
| Revised Date: | 31 August 2016 |
| Accepted Date: | 4 September 2016 |



Please cite this article as: L. Wu, Y. Wu, S. Jin, L. Zhang, Z. Xun, Gas sensitivity and photocatalytic performance of cuprous oxide with novel morphologies, *Chemical Physics Letters* (2016), doi: http://dx.doi.org/10.1016/j.cplett. 2016.09.008

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Gas sensitivity and photocatalytic performance of cuprous oxide with novel morphologies

Ling Wu*, Yulin Wu, Saijia Jin, Lun Zhang, Zhipeng Xun

College of Sciences, China University of Mining and Technology, Xuzhou City, 221116, P. R. China. *E-mail: wlwlcumt@163.com

Abstract:

In this work, Cu₂O nanoparticles (NPs) with quasi-spherical and bookmark-like morphologies were successfully synthesized via a new facile solution method. The morphologies of products were characterized to show porous surfaces and the size is as small as approximately 20~50 nm. Given the special morphology, Cu₂O NPs exhibited superior gas sensitivity to either ethanol or acetone vapors and strong adsorption abilities and high degradation activities for methyl orange under visible-light irradiation. The investigation provided not only a way of synthesizing Cu₂O particles with dozens of nanoscale, but also a way of improving its gas sensitivity and catalytic degradation ability.

1. Introduction

With high-speed development of social economy, environment pollution has become increasingly serious. In particular, haze weather, industrial and domestic wastewater have become serious problems needing urgent solutions. Photocatalytic degradation of organic pollutants is a simple, highly efficient and low-cost technology [1-4]. TiO₂ and ZnO semiconductor materials are widely used as photocatalysts [5-8]. However, the broad band gap of the TiO_2 and ZnO semiconductors (3.2 and 3.3 eV, correspondingly) made them to only respond to UV light. Hence, wide application of these semiconductors is limited to a certain extent. Cu_2O , a p-type direct band gap semiconductor, exhibits a forbidden band width of approximately 1.9 eV to 2.2 eV [2,7], corresponding to the highest energy density in the solar spectrum band. As a semiconductor material, the most significant advantage of Cu₂O is that it can absorb visible light and produce electron-hole pairs stimulated for catalytic degradation of some organic matter, which in a certain extent makes up for the defects of the photocatalytic degradation of ZnO and TiO₂ semiconductors in the visible-wavelength range. Therefore, Cu₂O offers potential applications in the field of photocatalysis. Moreover, micro-/nano-Cu₂O demonstrated many other excellent properties and important applications, such as gas-sensitive materials [9-12]. In the field of gas sensing, Cu₂O provides great potential applications in detecting pollutant gases because of its low cost and significant surface reactivity in both reducing and oxidizing gases. Reports revealed that Cu₂O can detect inorganic or volatile organic compound gases, including H₂S, NO₂, ethanol, and gasoline [13-18].

Download English Version:

https://daneshyari.com/en/article/5378411

Download Persian Version:

https://daneshyari.com/article/5378411

Daneshyari.com