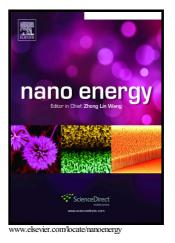
Author's Accepted Manuscript

Band-Gap-Matched CdSe QD/WS₂ Nanosheet Composite: Size-Controlled Photocatalyst for High-Efficiency Water Splitting

Yueyao Zhong, Yongliang Shao, Fukun Ma, Yongzhong Wu, Baibiao Huang, Xiaopeng Hao



 PII:
 S2211-2855(16)30501-8

 DOI:
 http://dx.doi.org/10.1016/j.nanoen.2016.11.011

 Reference:
 NANOEN1602

To appear in: Nano Energy

Received date: 11 September 2016 Revised date: 24 October 2016 Accepted date: 9 November 2016

Cite this article as: Yueyao Zhong, Yongliang Shao, Fukun Ma, Yongzhong Wu, Baibiao Huang and Xiaopeng Hao, Band-Gap-Matched CdSe QD/WS Nanosheet Composite: Size-Controlled Photocatalyst for High-Efficiency Wate Splitting, *Nano Energy*, http://dx.doi.org/10.1016/j.nanoen.2016.11.011

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable 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

ACCEPTED MANUSCRIPT

Band-Gap-Matched CdSe QD/WS₂ Nanosheet Composite: Size-Controlled Photocatalyst for High-Efficiency Water Splitting

Yueyao Zhong, Yongliang Shao, Fukun Ma, Yongzhong Wu, Baibiao Huang, Xiaopeng Hao*

State Key Lab. of Crystal Materials, Shandong University, Jinan, 250100, China Email: xphao@sdu.edu.cn

Keywords. Quantum dots, WS_2 nanosheets, Band gap energy matched, Photocatalytic hydrogen evolution, Nanocomposites

Abstract: Suitable band engineering is required in order to develop new photocatalysts for water splitting under visible light irradiation. Based on the quantum size effect, the band gap energy varies with the size of the quantum dots (QDs) tuning. Besides, tuning the band gap energy of CdSe QDs can match well with the band gap energy of WS₂ nanosheets, which is benefiting the separation of electron-hole pairs generated in CdSe QDs under irradiation. Some links exist between the photocatalytic activity and band gap energy of QDs. The highest rate of hydrogen evolution under visible light irradiation is 14 mmol h⁻¹ with 58% quantum efficiency at wavelength λ =420 nm when the QDs size is 7-8 nm and the band gap of QDs is 1.48 eV. Designing and fabricating band gap energy matched nanocomposite photocatalysts can present potential applications in solving future clean energy problems.

1. Introduction

Since the first report on using TiO_2 as catalyst for photoinduced water splitting in 1972, photocatalytic water splitting using semiconductors as catalysts has been considered a promising method to solve energy shortage and environmental remediation. [1] Numerous semiconductors, such as metal sulphides [2, 3] and metal oxide [4, 5], have been studied as photocatalysts. Quantum dots (QDs) have attracted extensive attention in recent years because of their substantial advantages over organic dyes, these advantages include size-tunable optical properties, broad absorption and high photochemical stability. [6-8] QDs are generally known as photoluminescence materials because of their ultrafast electron-hole recombination

Download English Version:

https://daneshyari.com/en/article/5452427

Download Persian Version:

https://daneshyari.com/article/5452427

Daneshyari.com