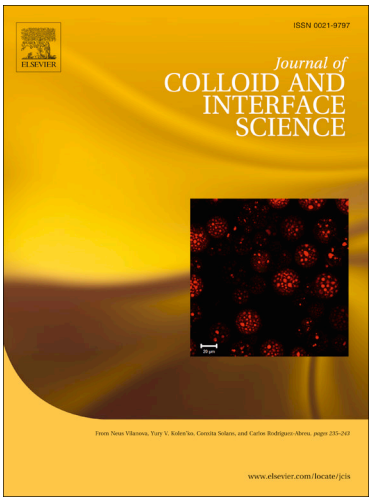

Low-temperature Construction of MoS_2 Quantum Dots/ZnO Spheres and their Photocatalytic Activity under Natural Sunlight

Wei Mei, Chuansheng Chen, Xi'an Chen, Xiaoyan Liu, Zhi Yang, Feng Ding, Zisheng Chao, Tiangui Liu

PII: S0021-9797(18)30771-9
DOI: https://doi.org/10.1016/j.jcis.2018.07.015
Reference: YJCIS 23806

To appear in: *Journal of Colloid and Interface Science*

Received Date: 8 April 2018
Revised Date: 3 July 2018
Accepted Date: 5 July 2018

Please cite this article as: W. Mei, C. Chen, X. Chen, X. Liu, Z. Yang, F. Ding, Z. Chao, T. Liu, Low-temperature Construction of MoS_2 Quantum Dots/ZnO Spheres and their Photocatalytic Activity under Natural Sunlight, *Journal of Colloid and Interface Science* (2018), doi: https://doi.org/10.1016/j.jcis.2018.07.015

Low-temperature Construction of MoS_2 Quantum Dots/ZnO Spheres and their Photocatalytic Activity under Natural Sunlight

Wei Mei[a], Chuansheng Chen[a*], Xi'an Chen[b], Xiaoyan Liu [a], Zhi Yang[b], Feng Ding[b], Zisheng Chao[a], Tiangui Liu[c]

[a]*College of Materials Science and Engineering, Changsha University of Science and Technology, Changsha 410114, China*

[b]*Zhejiang Key Laboratory of Carbon Materials, College of Chemistry and Materials Engineering, Wenzhou University, Wenzhou, 325027, People's Republic of China*

[c]*College of Physics and Microelectronics Science, Hunan University, Changsha 410082, China*

Abstract: Zinc oxide (ZnO) nanophotocatalyst is a promising candidate for degrading organic pollutants but has an extremely low photocatalytic activity under nature sunlight. In this work, flower-like MoS_2 quantum dots/ZnO (MQ/ZnO) nanospheres with the size of approximately 1.26 μm are prepared at low temperature. The resultant flower-like MQ/ZnO nanospheres displayed higher photocatalytic activity than pure ZnO nanospheres under natural sunlight and without stirring, with the decomposition rate of the MQ/ZnO composites approximately 3.3 times higher than that of the pure ZnO nanospheres. Furthermore, the introduction of MoS_2 QDs endowed ZnO nanospheres with optical memory ability. The enhanced sunlight-driven photocatalytic activity is dependent on the unique electrical properties of MoS_2 QDs and the synergistic effect between ZnO and MoS_2 QDs.

Keywords: MoS_2; quantum dots; flower-like nanospheres; photocatalytic activity; optical memory

1 Introduction

ZnO nanophotocatalyst has been widely applied for eliminating organic pollutants due to its high photocatalytic activity, low cost, and lack of toxicity [1, 2]. However, it is very difficult to recycle ZnO nanostructures in water because of their small size, limiting their practical application [3-5]. To date, much effort has been devoted to control the size and shape of ZnO nanostructures to obtain nanospheres, nanorods, nanosheets and other shapes in order to promote the application of ZnO nanophotocatalyst [6-8]. It is important to point out that the

Correspondent author: Tel: +86-731-85258490, E-mail: jxccs1934@csust.edu.cn (C.S.Chen).