

Accepted Manuscript

Full Length Article

Two-dimensional WS₂-based nanosheets modified by Pt quantum dots for enhanced room-temperature NH₃ sensing properties

Chao Ouyang, Yunxiang Chen, Ziyu Qin, Dawen Zeng, Jian Zhang, Hao Wang, Changsheng Xie

PII: S0169-4332(18)31462-4
DOI: <https://doi.org/10.1016/j.apsusc.2018.05.148>
Reference: APSUSC 39424

To appear in: *Applied Surface Science*

Received Date: 21 November 2017
Revised Date: 17 April 2018
Accepted Date: 19 May 2018

Please cite this article as: C. Ouyang, Y. Chen, Z. Qin, D. Zeng, J. Zhang, H. Wang, C. Xie, Two-dimensional WS₂-based nanosheets modified by Pt quantum dots for enhanced room-temperature NH₃ sensing properties, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.05.148>

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.



Two-dimensional WS₂-based nanosheets modified by Pt quantum dots for enhanced room-temperature NH₃ sensing properties

Chao Ouyang,^{a,b} Yunxiang Chen,^c Ziyu Qin,^{a,b} Dawen Zeng,^{a,b,*} Jian Zhang,^{a,b} Hao Wang^{a,b} and Changsheng Xie^a

- a* State Key Laboratory of Materials Processing and Die & Mould Technology, Nanomaterials and Smart Sensors Research Laboratory, Department of Materials Science and Engineering, Huazhong University of Science and Technology, Wuhan 430074, PR China
- b* Hubei Collaborative Innovation Center for Advanced Organic Chemical Material, Hubei University, Wuhan 430062, PR China
- c* Development Department, Zhejiang Institute of Mechanical and Electrical Engineering Science and Technology

Abstract

As a typical two-dimensional (2D) layered transition metal dichalcogenides (TMDs), tungsten disulfide (WS₂) has been considered as a promising sensing material for room-temperature NH₃ detection. However, the bulk WS₂-based room-temperature NH₃ sensors can hardly recover to its initial state after turning off gas. Although the recovery rate of bulk WS₂ was accelerated by thinning method, the response of few- or monolayer WS₂ nanosheets (NSs) to NH₃ was sharply decreased. Here, in premise of keeping fast recovery rate, few- or monolayer WS₂ NSs modified with Pt quantum dots (QDs) were prepared for room-temperature NH₃ detection, which exhibited significantly enhanced sensing properties with fast recovery speeds. Especially, the response of nanocomposite to 250 ppm NH₃ is nearly 10 times than that of WS₂ NSs, which could be attributed to the significantly decreased initial conductivity caused by electrons flowing from higher Fermi level of Pt QDs to that of WS₂ NSs and the higher catalytic activity. Furthermore, the Pt-S bonds confirmed by XPS results could benefit electrons transfer between the interface. We hope that the 0D/2D heterostructure system in this work could provide a direction to improve sensing properties of 2D TMDs-based room-temperature sensors.

Keywords:

Download English Version:

<https://daneshyari.com/en/article/7833065>

Download Persian Version:

<https://daneshyari.com/article/7833065>

[Daneshyari.com](https://daneshyari.com)