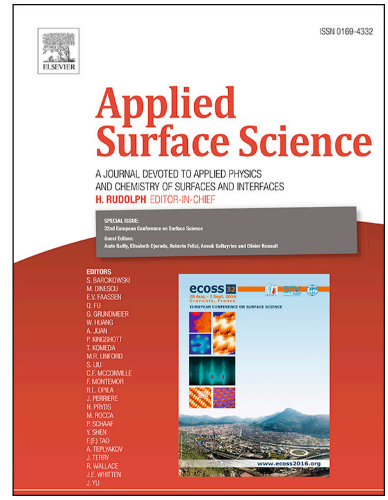
Accepted Manuscript



Full Length Article

Fabrication of Dual Direct Z-scheme g-C_3N_4/MoS_2/Ag_3PO_4 Photocatalyst and Its Oxygen Evolution Performance

Lin Tian, Xiaofei Yang, Xingkai Cui, Qinqin Liu, Hua Tang

PII: S0169-4332(18)32352-3
DOI: https://doi.org/10.1016/j.apsusc.2018.08.209
Reference: APSUSC 40246

To appear in: *Applied Surface Science*

Received Date: 10 May 2018
Revised Date: 22 August 2018
Accepted Date: 23 August 2018

Fabrication of Dual Direct Z-scheme g-C_3N_4/MoS_2/Ag_3PO_4 Photocatalyst and Its Oxygen Evolution Performance

Lin Tian [a], Xiaofei Yang [a,b,c] *, Xingkai Cui [a], Qinqin Liu [a], Hua Tang [a] *

[a] *School of Materials Science & Engineering, Jiangsu University, Zhenjiang 212013, P. R. China*
[b] *College of Science, Nanjing Forestry University, Nanjing 210037, P. R. China*
[c] *State Key Laboratory of Photocatalysis on Energy and Environment, Fuzhou University, Fuzhou 350116, P. R. China*

Abstract:

Semiconductor-based photocatalytic materials have emerged as promising candidates for solar-driven hydrogen production and oxygen evolution reactions. Direct Z-scheme photocatalysts offer competitive advantages that are superior to single-component or intensively studied heterojunction photocatalysts in photocatalytic water splitting. The development of high-performance direct Z-scheme photocatalysts is crucial to improving solar-driven water splitting efficiency. Herein, we report the fabrication of a novel g-C_3N_4/MoS_2/Ag_3PO_4 ternary composite and its application in photocatalytic oxygen evolution under white light LED illumination. As-exfoliated, highly conductive two-dimensional molybdenum disulfide (2D MoS_2) nanoflakes and modified graphitic carbon nitride (g-C_3N_4) nanosheets were employed simultaneously to couple with oxygen-evolving silver orthophosphate (Ag_3PO_4), forming a dual direct Z-scheme g-C_3N_4/MoS_2/Ag_3PO_4 (CMA) composite photocatalytic system for highly improved oxygen evolution from water splitting. The optimal CAM-20 exhibits the fastest oxygen-producing rate of 232.1 $\mu mol \cdot L^{-1} \cdot g^{-1} \cdot h^{-1}$, which is 5 times higher than that of bulk Ag_3PO_4. The enhancement in the photocatalytic oxygen evolution can be ascribed to synergistic effects of improved visible light absorption, more efficient separation of photoexcited electron-hole pairs and a specific charge transfer pathway of tandem dual direct Z-scheme configuration under light illumination. This work paves the way for the construction of direct Z-scheme composite photocatalytic systems in water splitting.

Keywords: g-C_3N_4; MoS_2; Ag_3PO_4; oxygen evolution; water splitting; direct Z-scheme

* Corresponding authors.
E-mail: xiaofei_yang1980@163.com (Prof. X. Yang); tanghua@mail.ujs.edu.cn (Prof. H. Tang)