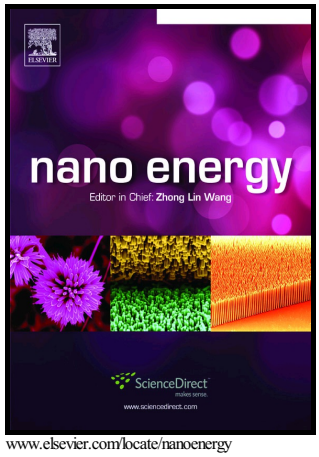

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PII: S2211-2855(18)30141-1
DOI: https://doi.org/10.1016/j.nanoen.2018.03.012
Reference: NANOEN2560

To appear in: *Nano Energy*

Received date: 14 November 2017
Revised date: 28 February 2018
Accepted date: 4 March 2018

Cite this article as: Yanna Guo, Jing Tang, Zhongli Wang, Yong-Mook Kang, Yoshio Bando and Yusuke Yamauchi, Elaborately Assembled Metal Sulfides as a Bifunctional Core-Shell Structured Catalyst for Highly Efficient Electrochemical Overall Water Splitting, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2018.03.012

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Abstract

Low efficiency, short lifetimes, and limited kinds of catalysts are still three fundamental shortcomings that have plagued electrochemical water splitting. Herein, we rationally synthesized a cost-effective Co_3S_4@MoS_2 hetero-structured catalyst that has proven to be a highly active and stable bifunctional catalyst for both hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) in an alkaline environment. The heterostructure was obtained *via* a first hydrothermal approach to obtain hollow Co_3S_4 nanoboxes based on the ionic exchange reaction between $Fe(CN)_6^{3-}$ of Co-Fe Prussian blue analogue (PBA) and S^{2-} at 120 ºC, and the subsequent *in-situ* growth of MoS_2 nanosheets on the surface of Co_3S_4 nanoboxes at an elevated temperature of 200 ºC. The synergistic effects between the active and stable HER catalyst of MoS_2 and the efficient OER catalyst of Co_3S_4, as well as the morphological superiority of hollow and