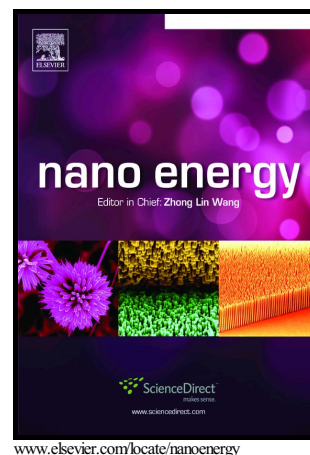


Author's Accepted Manuscript

Structural and electronic optimization of graphene encapsulating binary metal for highly efficient water oxidation

Yunchuan Tu, Pengju Ren, Dehui Deng, Xinhe Bao



PII: S2211-2855(18)30550-0
DOI: <https://doi.org/10.1016/j.nanoen.2018.07.062>
Reference: NANOEN2929

To appear in: *Nano Energy*

Received date: 12 June 2018
Revised date: 28 July 2018
Accepted date: 29 July 2018

Cite this article as: Yunchuan Tu, Pengju Ren, Dehui Deng and Xinhe Bao, Structural and electronic optimization of graphene encapsulating binary metal for highly efficient water oxidation, *Nano Energy*, <https://doi.org/10.1016/j.nanoen.2018.07.062>

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 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.

Structural and electronic optimization of graphene encapsulating binary metal for highly efficient water oxidation

Yunchuan Tu^{a,b,c,1}, Pengju Ren^{d,e,1}, Dehui Deng^{a,b,*}, Xinhe Bao^{a,*}

^a State Key Laboratory of Catalysis, *iChEM*, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Zhongshan Road 457, Dalian 116023, China.

^b Collaborative Innovation Center of Chemistry for Energy Materials (*iChEM*), College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, China.

^c University of Chinese Academy of Sciences, Beijing 100049, China.

^d State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, Chinese Academy of Sciences, Taiyuan, Shanxi 030001, China.

^e National Energy Center for Coal to Liquids, Synfuels China Co. Ltd., Huairou, Beijing 101407, China.

* Corresponding authors. E-mail: dhdeng@dicp.ac.cn; xhbao@dicp.ac.cn.

¹ These authors contributed equally to this work.

Abstract

Encapsulating non-precious metals within graphene layers represents a promising strategy to substitute precious metal catalyst towards the oxygen evolution reaction (OER). The surface electronic structure of graphene can significantly affect the OER performance, which depends on the types of encapsulated metal and their proportion but it still lacks efficient methods to modulate them. Herein, we report a universal strategy to encapsulate FeNi binary metal nanoalloy within ultrathin graphene layers, which can efficiently optimize the electronic properties and the OER activity on the graphene surface via modulating Fe/Ni ratio. The optimized catalyst with Fe/Ni of 1 shows a low overpotential of 280 mV at the current density of 10 mA cm⁻². Both the catalytic activity and durability of the catalyst are better than the commercial IrO₂. Theoretical calculations indicate that the adsorption strength of each intermediate on graphene can be optimally balanced by modulating the metal proportion of the encapsulated FeNi, leading to an enhanced OER activity with reduced overpotential on the graphene surface.

Download English Version:

<https://daneshyari.com/en/article/11006957>

Download Persian Version:

<https://daneshyari.com/article/11006957>

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