Short Communication

One Step Hydrothermal Synthesis of Ni-MoS₂-RGO Bifunctional Electrocatalysts for HER and OER

Min Zhao^{1,2}, Gaoliang Zhou¹, Xiaoman Liu¹, Xinyi Shen¹, Jianguo Lv^{1,2,*}, Changjuan Hu¹, Ying Wang¹, Wei Tan¹, Shengjie Sun¹, Yuxuan Ma¹, Congrong Wang¹, Jin Yang¹, Miao Zhang^{2,3,*}, Gang He^{3,*}, Lei Yang⁴

¹ School of Physics and Materials Engineering, Hefei Normal University, Hefei 230601, China

² Key Laboratory for Photoelectric Detection Science and Technology of Education Department of Anhui Province, Hefei Normal University, Hefei 230601, China

³ School of Physics and Material Science, Anhui University, Hefei 230039, China

⁴ Department of Chemistry and Materials Engineering, Hefei University, Hefei 230601, China

*E-mail: lvjg1@163.com, zhmiao@ahu.edu.cn, hegang@ahu.edu.cn

doi: 10.20964/2021.03.46

Received: 11 November 2020 / Accepted: 30 December 2020 / Published: 31 January 2021

Pure MoS₂ and Ni-MoS₂-RGO were prepared by a one-step hydrothermal approach. The result indicated that intensity of XRD diffraction peaks for MoS₂ increase slightly as with the increase of RGO content. Mesopores of the MoS₂, Ni-MoS₂/RGO-10 and Ni-MoS₂/RGO-15 are mainly distributed in the pore diameter range of 2-50 nm. The addition of RGO increase the layer numbers of MoS₂ in Ni-MoS₂/RGO. Two Raman characteristic peaks at about 378 and 400 cm⁻¹ according to A_{1g} and E_{2g} modes have been observed in the MoS₂ and Ni-MoS₂/RGO. The electrocatalytic test results show that the Ni-MoS₂/RGO-5 has the lowest overpotentials of 349 mV at a current density of 10 mA cm⁻² for OER and the Ni-MoS₂/RGO-10 has the lowest overpotentials of 398 mV at a current density of 10 mA cm⁻² for HER. Moderate Ni doping and RGO composites can effectively improve the intrinsic conductivity, the hydrogen adsorption free energy for HER, as well as providing more active sites for HER and OER.

Keyword: Ni-MoS₂-RGO; Oxygen evolution reaction; electrocatalysts; Hydrothermal method

[FULL TEXT](#)

© 2021 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).