One-step Hydrothermal Synthesis of Ultralow Pt Loading Ni(OH)₂ for Enhanced Hydrogen Evolution Reaction

Jiao Chen¹, Hongye Qin¹, Yaping Pan¹, Jinli Wu¹, Jianan Liu¹, Wanying Lin¹, Jun Jiang¹, Enzuo Liu^{1,2}, Junwei Sha¹, Fang He¹, Liying Ma^{1,*}, Naiqin Zhao^{1,2,3}

¹ School of materials science and engineering and Tianjin Key Laboratory of Composites and Functional Materials, Tianjin University, Tianjin 300350, China

² Collaborative Innovation Center of Chemical Science and Engineering, Tianjin 300350, China

³ Key Laboratory of Advanced Ceramics and Machining Technology, Ministry of Education, Tianjin, 300350, China

*E-mail: lyma@tju.edu.cn

doi: 10.20964/2021.07.38

Received: 9 March 2021 / Accepted: 4 May 2021 / Published: 31 May 2021

It is necessary and challenging to develop platinum-based electrocatalysts with low Pt content and high performance for industrial development in a suitable strategy. Herein, ultralow Pt (0.35 wt%) loading Ni(OH)₂ nanosheets (named as 2-Pt/Ni(OH)₂) with cataphracted structure is synthesized on nickel foam by one-step hydrothermal process. It only needs an overpotential of 34 mV to achieve a current density of 10 mA cm⁻² without any significant decrease for 40 hours. This excellent performance of hydrogen evolution reaction (HER) is attributed to the fact that the cataphracted structure not only has a larger active area and more active sites, but also effectively limits the size of Pt nanoparticles to 2~3 nm, which results in a higher active quality. In addition, the relatively simple and easily operational one-step method can reduce the Pt content to 0.35 wt% significantly. This facile strategy opens up new approaches in the rational design and synthesis of low loading Pt electrocatalysts with eminent electrocatalytic activity for industrial production.

Keywords: Pt/Ni(OH)₂, hydrothermal method, cataphracted structure, hydrogen evolution reaction

[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/>).