Short Communication

Preparation of Three-dimensional Mesoporous Carbon Electrode Materials as Electrocatalysts for Hydrogen Evolution Reaction

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doi: 10.20964/2021.04.45

Received: 30 November 2020 / Accepted: 26 January 2021 / Published: 28 February 2021

In order to improve the electrochemical performance of hydrogen evolution electrode, this paper presents a new method of the preparation of the negative electrode materials with high activity of hydrogen evolution. Based on the principle of self-assembly, polyphosphazene microspheres were prepared by precipitation polymerization and carbonized in N₂ atmosphere to form blank porous carbon spheres with excellent electrical conductivity, good physical/chemical stability and outstanding absorption performance. Then NiO/Ni@C-PZS were prepared by chemical precipitation method and carbonization loading method, and labeled as sample A and sample B, respectively. It was observed that, compared with the blank carbon spheres, sample A and sample B had higher hydrogen evolution activities by electrochemical measurement. Under the same scan rate, the capacitance performance of sample A and sample B are improved significantly and have obvious redox peaks. It can be found from the LSV that the hydrogen evolution overpotential of sample A is 0.4 V (vs. RHE), and the η of sample A is basically unchanged after 100 cycles, which indicates that sample A has good cycle stability. The result that the tafel slope of sample B is only 81 mV·dec⁻¹, far lower than the 122 mV·dec⁻¹ of C-PZS, indicating that the existence of NiO/Ni plays an important role in hydrogen evolution activity of NiO/Ni@C-PZS electrodes and the hydrogen evolution reaction is consistent with the Volmer-Heyrovsky mechanism.

Keywords: Hydrogen evolution electrode, Porous carbon material, Electrocatalysis

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