Hierarchical Porous NiS@NiO Nanoarrays in Situ Grown on Nickel Foam as Superior Electrocatalyst for Water Splitting

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The development of economic and efficient bifunctional water-splitting catalysts in case of the oxygen evolution reaction (OER) and hydrogen evolution reaction (HER) is of considerable practical significance. Herein, a hierarchical porous NiS@NiO nanoarray with a large surface area was prepared in situ on nickel (Ni) foam as a water-splitting catalyst via a simple hydrothermal method. The core-shell NiS@NiO/NF hybrid exhibits an excellent bifunctional performance with low overpotentials of 150 and 319 mV to achieve an HER current density of 10 mA cm⁻² and a large OER current density of 100 mA cm⁻², respectively, in the 1.0 M KOH solution because of its high specific surface area and the interface between the two phases. Furthermore, NiS@NiO/NF exhibits a cell voltage of 1.54 V for overall water splitting and extremely high stability for more than 50 h at 10 mA cm⁻². This study will help to design and develop high-performance hybrid nanomaterials via interfacial engineering for obtaining clean energy conversion technologies.

Keywords: Nanocomposite; Heterointerface; Electrocatalysis; HER/OER; Water splitting.

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