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Flower-like NiFe Oxide Nanosheets on Ni Foam as Efficient Bifunctional Electrocatalysts for the Overall Water Splitting

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Since the oxygen evolution reaction (OER) is a fundamental step in the overall water splitting process, it is necessary for an ideal catalyst to require a small amount of energy to overcome the energy barrier at the electrode-electrolyte interface. Therefore, developing highly active and integrated catalysts is of great significance. Herein, we present a facile and viable method to fabricate flower-like NiFe oxide nanosheets electrocatalysts that are directly grown on nickel foam substrates through a hydrothermal reaction. By tuning the Ni:Fe ratio, the as-synthesized NiFe oxide exhibits excellent catalytic activity that surpasses the activity of the RuO_2 benchmark catalyst, when tested as an electrocatalyst for the overall water splitting reaction. More importantly, the optimized NiFe oxide electrode possesses excellent OER activity in 1 M KOH with small overpotentials of 255 and 280 mV at 10 and 50 mA cm^{-2}, respectively. When employed as a stable bifunctional catalyst to split water, this electrode achieved a current density of 10 mA cm^{-2} at a cell voltage of 1.59 V. This work presents a highly promising candidate for use as an electrode material and represents promising progress in its practical utilization and comprehensive industrialization.

Keywords: NiFe oxide; oxygen evolution reaction; bifunctional catalyst; electrocatalysts

FULL TEXT