

Fe-doped Nickel Sulfide Nanoparticles as Advanced Bifunctional Catalysts for Overall Water Splitting

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Herein, we fabricated Fe-doped Ni₃S₂ nanoneedles directly grown on Ni foam through two-step processes including hydrothermal reaction and sulfidation with thioacetamide. The as-prepared catalysts were used as electrocatalysts for overall water splitting. Among the prepared samples, the Fe-doped Ni₃S₂ on Ni foam displayed the best electrochemical performance as a bifunctional electrocatalyst for both OER and HER with a low overpotential of 222 and 281 mV for a current density of 50 mA cm⁻² for the OER and HER, respectively. Moreover, when the as-obtained Fe-doped Ni₃S₂ is applied to a bifunctional electrocatalyst in an electrolyzer, a low cell voltage of 1.59 V is obtained to drive a current density of 10 mA cm⁻² with outstanding long-term durability. The outstanding electrochemical performance of Fe-doped Ni₃S₂ is mainly ascribed to the synergistic effect of the binary metal system, leading to improving the conductivity, active surface area, and intrinsic catalytic activity.