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Integrated Ni₂P nanosheet arrays on three-dimensional Ni foam for highly efficient water reduction and oxidation

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Abstract

The large-scale synthesis of efficient nonprecious bifunctional electrocatalysts for overall water splitting is a great challenge for future renewable energy conversion systems. Herein, Ni₂P nanosheet arrays directly grown on three-dimensional (3D) Ni foam (NiP/NF) are fabricated by hydrothermal treatment of metallic Ni foam with H₂O₂ solution and subsequent phosphidation with NaH₂PO₂. The NiP/NF as electrocatalyst exhibits superior activities for both hydrogen evolution reaction (HER) and oxygen evolution reaction (OER). Most importantly, employing both as the cathode and anode for an alkaline water electrolyzer, NiP/NF only requires a cell voltage of 1.63 V to reach a current density of 10 mA cm⁻², together with stronger durability. Preliminary catalytic information suggests that the tailored 3D superstructure and integrated electrode configurations afford improved active sites and enhanced electron/mass transfer, responding for the outstanding activity and stability.

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