$Ni(OH)_2$-WP hybrid nanorod arrays for highly efficient hydrogen evolution reactions in alkaline media

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Developing efficient non-noble hydrogen evolution electrocatalysts in alkaline media is crucial for sustainable, ecofriendly production of H_2 through water electrolysis. Herein, we report novel alkaline HER catalyst of $Ni(OH)_2$-decorated WP nanorod arrays on carbon paper synthesized by thermal evaporation and electrodeposition. This hybrid catalyst displays outstanding HER activity and requires a low overpotential of only 77 mV to obtain a current density of 10 mA/cm2 and Tafel slope of 71 mV/dec. The hybrid catalyst also shows long-term electrochemical stability, maintaining its activity for 18 h. This superior HER performance is attributed to the synergetic effect of $Ni(OH)_2$, which reduces the energy barrier of the water dissociation step and provides active sites for hydroxyl adsorption, and WP, which adsorbs hydrogen intermediates and produces H_2 gas. This interfacial cooperation offers not only excellent HER catalytic activity but also new strategies for fabricating non-noble, effective electrocatalysts in alkaline media.