NiCoP Nanoparticles as Efficient Electrocatalyst for Oxygen Evolution Reaction in an Alkaline Solution

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Water splitting can acquire clean energy. To enhance the water splitting ability, electrocatalysts qualify high catalytic ability and low cost are need to be explored. Herein, a bimetal phosphide (NiCoP) nanomaterial is reported as an efficient electrocatalyst for water oxidation. The ternary nickel cobalt phosphide nanoparticles were synthesized from the solution-phase reaction of organic Co and Ni precursors with trioctylphosphine. The nanoparticle size is 18 ± 5 nm. After annealing, the catalytic ability of NiCoP is significantly enhanced. The overpotential decreased from 480 to 330 mV vs RHE at 10 mA cm^{-2} in 1 mol dm^{-3} KOH alkaline solution. When hydrophilic carbon nanotubes (CNTs) mixed with the NiCoP to form hybrid NiCoP-CNTs, the overpotential further decreased from 330 to 320 mV vs RHE at 10 mA cm^{-2} . The Tafel slopes of ca. 69 and 52 mV are found for annealed NiCoP and NiCoP-CNTs, respectively. The stability test of NiCoP-CNTs also shown the remarkable catalytic activity for long-term operation.

Keywords: NiCoP, bimetal phosphide, electrocatalyst, water oxidation

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