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Abstract:

Significant efforts have been focused on the search of earth-abundant elements to solve growing energy issues and to provide bifunctional behavior for both hydrogen and oxygen evolution reaction. Mixed transition metals could provide promising synergistic electrochemical properties and serve as bi-catalyst for overall water splitting process. In this study, a needle grass array of nanostructured nickel cobalt sulfide ($NiCo_2S_4$) was synthesized using a hydrothermal process. The synthesized $NiCo_2S_4$ electrodes showed promising electrocatalytic activity with a low overpotential of 148 mV and 293 mV for hydrogen and oxygen evolution reactions, respectively. The electrolyzer cell consisting of two $NiCo_2S_4$ electrodes displayed excellent performance with high electrochemical stability and low overall cell potential of 1.61 V to achieve a current density of 10 mA/cm^2. Our study suggests that mixed transition metal chalcogenides such as $NiCo_2S_4$ could be used as efficient and stable electrocatalyst for overall water splitting process.

KEYWORDS: NiCo-OH, $NiCo_2S_4$, OER, HER, water electrolysis

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