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Facile assembly of $Ni(OH)_2$ Nanosheets on Nitrogen-doped Carbon Nanotubes Network as High-Performance Electrocatalyst for Oxygen Evolution Reaction

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ABSTRACT

Developing non-noble metal-based electrocatalysts with cost-effective materials for water splitting is critical to clean energy generation and storage. However, the process of water splitting is greatly hindered by the oxygen evolution reaction (OER), which is kinetically sluggish and requires large overpotentials. Herein, we report an active and stable OER catalysts by electrodeposition of ultrathin $Ni(OH)_2$ nanosheets on three-dimensional interwoven nitrogen-doped carbon nanotubes (N-CNTs). The $Ni(OH)_2$ nanosheets grown on the N-CNTs afforded a current density of 10 mA cm^{-2} at the overpotential of only 254 mV, smaller than the commercial IrO_2 catalyst. Moreover, the as-prepared catalyst shows long-term durability almost without degradation over 100 h. The excellent OER activity can be ascribed to the unique layered structure of $Ni(OH)_2$, the ultrathin and interconnected features of the nanosheets, and the three-dimensional (3D) porous conducting network of the N-CNTs. The rational design strategy can be extended to the preparation of other non-precious metal catalysts with enhanced OER performance.

Keywords: Electrodeposition, $Ni(OH)_2$, Chemical vapor deposition, Nitrogen-doped carbon nanotubes, Oxygen evolution reaction