Synthesis and Characterization of Fe³⁺ and CeO₂ Co-decorated NiOOH Electrocatalysts Supported by Nickel Foam for the Oxygen Evolution Reaction

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Inexpensive and non-noble metal catalysts for the oxygen evolution reaction (OER) with high activity and stability must be developed to enhance water electrolysis for hydrogen production. Herein, Fe³⁺ dopants and flower-shaped CeO₂-decorated NiOOH catalysts are synthesized, and the synergetic effect of Fe³⁺ dopants and CeO₂ are investigated. The presence of both Fe³⁺ dopants and CeO₂ produces more NiOOH species and more oxygen vacancies in the NiOOH structure as measured by X-ray photoelectron spectroscopy. Electrochemical measurements illustrate that the increase in oxygen vacancies in NiOOH significantly increases the conductivity and activity of the catalyst and reduces the OER overpotential. Among the catalysts studied in this research, CeO₂-NiFeOH/NF, which is modified by both Fe³⁺ dopants and CeO₂, hosts the highest number of oxygen vacancies. It also has the lowest overpotential (280 mV), the highest current density, and excellent stability with high performance for the OER.

Keywords: Oxygen Vacancy, Cerium Oxide, Fe³⁺ Dopant, NiOOH, Oxygen Evolution Reaction

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