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Fe-doped NiCo Oxide Nanosheet Catalyst for Highly-Efficient Oxygen Evolution Reaction

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Extended Abstract

To fulfill the increasing energy demand with consideration of the environment and the limited availability of material resources, efficient and cost-effective energy conversion and storage devices which are combined with renewable energy sources have been devised and tested. Among the various devices, electrochemical hydrogen generation from water splitting is promising because of their unique advantages and environmental friendliness. For electrocatalytic water splitting, the following two types of reactions occur: the oxygen evolution reaction (OER) at the anode and the hydrogen evolution reaction (HER) at the cathode [1].

Over the past few decades, metal hydroxides/oxides have been used as efficient OER and HER catalysts [2-4]. Electrocatalytic and electrochemical activities are strongly dependent on electrical conductivity, morphology, and the number of active sites of the electrodes used. It has been demonstrated that nanostructured catalysts with large surface area and defect-induced active reaction sites significantly reduce OER overpotential (< 300 mV) [5,6].

Here, mesoporous Fe-doped NiCo oxide (FNCO) nanosheets are prepared on Ni foam via a binder-free electrodeposition technique that is followed by annealing and $NaBH_4$ treatment. Well-defined mesoporous nanosheets with different Ni–Co compositional ratios are obtained by varying the Ni and Co precursor concentrations. The optimized FNCO nanosheet catalyst exhibits a very low overpotential (~190 mV at 10 mA cm^{-2} in 1M KOH) with a Tafel slope of 34 mV dec^{-1}.

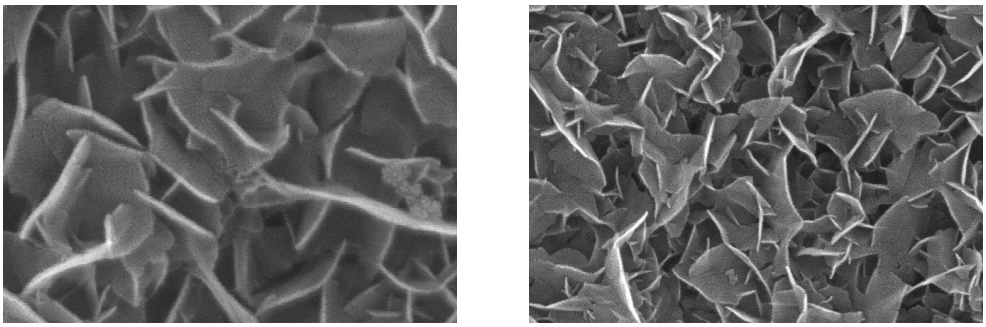

Fig. 1: Scanning electron microscope images of Fe-doped NiCo oxide nanosheets.

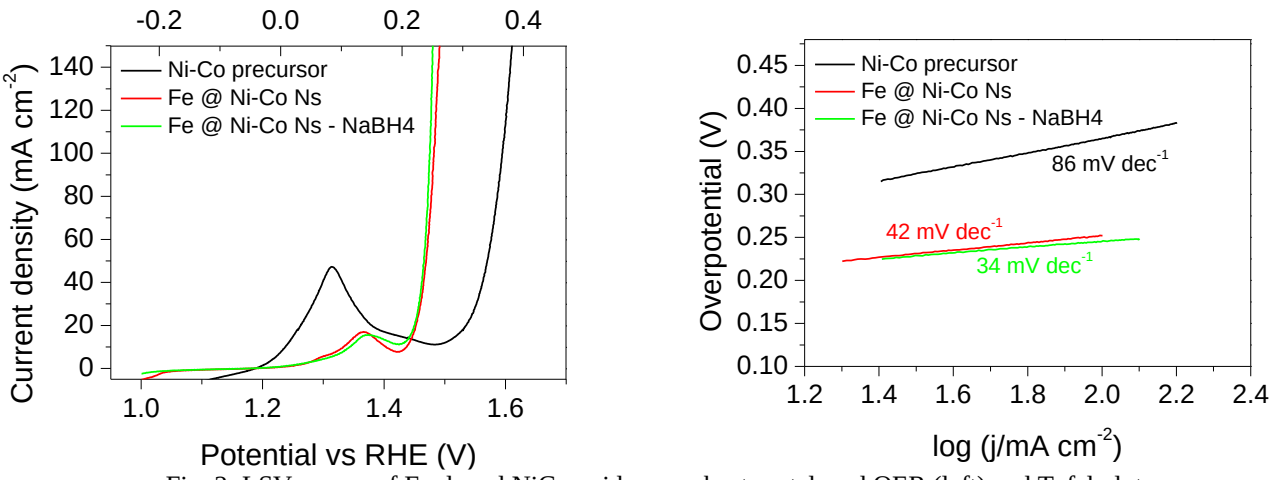

Fig. 2: LSV curves of Fe-doped NiCo oxide nanosheets catalyzed OER (left) and Tafel plot.

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