COPPER-DOPED NICKEL OXYHYDROXIDE FOR EFFICIENT ELECTROCATALYTIC ETHANOL OXIDATION

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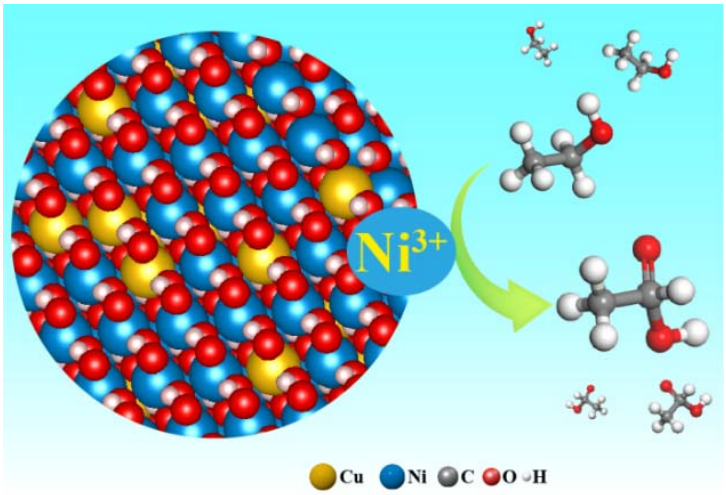
The electrochemical oxidation of alcohols is a major focus of energy and chemical conversion efforts, which exhibited potential applications ranging from fuel cells to biomass utilization and fine chemical synthesis [1]. Ethanol (CH_3CH_2OH), as a biomass liquid fuel, has been regarded as one of the most promising renewable energy carriers and important green chemicals. Rational design of low-cost and efficient electrocatalysts for ethanol oxidation reaction (EOR) is imperative for electrocatalytic ethanol fuel cells. Ni can allow to activate water molecules and provide sites for OH adsorption ($H_2O \rightarrow OH_{ads} + H^+ + e^-$), while the presence of OH_{ads} is beneficial for the complete oxidation of CO intermediates to avoid catalyst poisoning [2]. Therefore, Ni-based materials have been approached as a type promising non-noble metal based EOR electrocatalysts. In this work, we developed a copper-doped nickel oxyhydroxide (Cu-doped NiOOH) catalyst as an efficient electrocatalyst for selective ethanol oxidation to acetate via *in situ* electrochemical reconstruction of a NiCu alloy. The introduction of Cu dopants increases the specific surface area and more defect sites, as well as forms high-valence Ni sites. The Cu-doped NiOOH electrocatalyst exhibited an excellent EOR performance with a peak current density of 227 $mA \cdot cm^{-2}$ at 1.72 V versus reversible hydrogen electrode, high Faradic efficiencies for acetate production (> 98%), and excellent electrochemical stability. Our work suggests an attractive route of designing non-noble metal based electrocatalysts for ethanol oxidation.



[1] A. Badalyan, S. S. Stahl, *Nature*, **2016**, 535, 406–410.

[2] J. E. Sulaiman, S. Q. Zhu, Z. L. Xing, Q. W. Chang, M. H. Shao, *ACS Catal.*, **2017**, 7, 5134–5141.