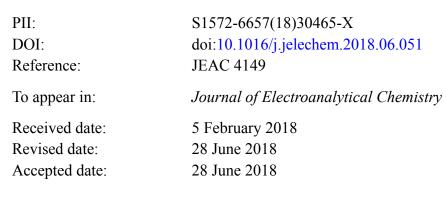
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ACCEPTED MANUSCRIPT

Enhanced Oxygen Evolution Activity of Co_{3-x}Ni_xO₄ compared to Co₃O₄ by low Ni doping Aditi Singhal^{1*} Anuj Bisht² and Silvia Irusta³

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Abstract:

We herein report a series of nanocrystalline Ni-doped Co₃O₄: Co_{3-x}Ni_xO₄ (0.0075 \leq x \leq 0.30) with a nickel doping percentage from 0.25 to 10 atomic percent synthesized using solution combustion method. These oxides are characterized by XRD and show pure nanocrystalline phase of Co₃O₄ with no separated peaks related to Ni/NiO_x and confirms that Ni has been substituted in the lattice. TEM results indicate that the morphology and size of all the compounds are similar. Electrochemical measurements indicate that Co₃O₄ and Co_{3-x}Ni_xO₄ are active for oxygen evolution reaction (OER) and also shows that that low amount of nickel doping in Co₃O₄ can remarkably enhance OER activity in neutral, alkaine and buffer (pH-7) electrolytes. Out of all compositions, 0.5% Ni-doped Co₃O₄ (Co_{2.985}Ni_{0.015}O₄) seems to be more active than Co₃O₄ in terms of both current density and onset potential in K₂SO₄ medium. The enhancement in terms of OER activity, however, decreases until the doping concentration reaches beyond 0.5%. Phosphate buffer solution (PBS) studies reveal that Co₃O₄ and 0.5% Ni-doped Co₃O₄ show OER at near thermodynamic potential. Detailed x-ray photoelectron spectroscopy (XPS) studies have indicated that surface oxygen (lattice oxygen) concentration is an important factor in deciding the OER activity which is highest for 0.5% Ni doped Co₃O₄ (Co_{2.985}Ni_{0.015}O₄) and hence gives the highest OER activity.

Introduction

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