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Accelerating Oxygen Evolution Reaction via Sodium Extraction of $Na_{0.71}CoO_2$

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ABSTRACT: Developing efficient and cost-effective electroctalysts to accelerate the sluggish kinetics of the oxygen evolution reaction (OER) is of great importance to emerging renewable energy technologies. In this work, a chemical sodium extraction of Na from low-cost $Na_{0.71}CoO_2$ electrocatalyst was demonstrated as an effective way to enhance its catalytic activity and durability toward enhancing OER. By continously extracting sodium ions out of $Na_{0.71}CoO_2$ for 2 days, a low overpotential η (0.44 V) at 10 mA cm^{-2}, a good mass activity (65.93 mA mg^{-1}) and a small Tafel slope (55 mV dec^{-1}) were achieved, which are superior to those of using precious metal oxide IrO_2. XPS measurements and BET surface areas investigations suggest that the dramatic improved OER performance should be ascribed to several major factors, including formed Co^{4+} ions oxidized from Co^{3+}, increased surface oxygen vacancies and enlarged specific surface areas occurred during the Na extraction process. The research here highlights the importance of tuning cation deficiency in Na-based oxides for further designing advanced OER electrocatalysts.

Key words: OER, Structure Engineering, Na-based, Electrocatalysts