Deactivation mechanism of Ni(OH)2 electrode in oxygen evolution reaction : in situ XAFS studies.

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Nanoscaled electrocatalysts have provided promising activity and stability because of its high surface areas, complicated morphologies. Behavior of degradation according to plating thickness for Oxygen Evolution Reaction(OER) was investigated. The $Ni(OH)_2$ catalysts were electrodeposited on carbon paper at -6mA for various times at room temperature, and OER was measured in 1M KOH between 0 and 0.9V(V vs Hg/HgO) at a scan rate of 5.0 mV/s. The oxidation states were investigated by in situ X-ray absorption near edge structure (XANES) for identify the OER mechanism of $Ni(OH)_2$. Also, stability was determined by the ratio of the first anodic current peak to cathodic current peak. Overall, it was demonstrated that for the first cycle, there is a phase conversion of α-$Ni(OH)_2$ to γ-NiOOH, and it is reduced to β-$Ni(OH)_2$, it changes to β-NiOOH for the rest of the cycle. In addition, the thinner the plating, the more reversible it is.