

Water oxidation in the presence of a nickel coordination compound: decomposition products, Fe impurity in the electrolyte, and a candidate as a catalyst.

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Streszczenie

Sustainable energy sources require a large-scale storage system. Water electrolysis toward hydrogen formation is a remarkable method for energy storage. However, oxygen-evolution reaction (OER) through water-oxidation reaction is a bottleneck in water-splitting systems. Different Ni-based molecular structures have been claimed to be OER catalysts. However, the impact of Ni (hydr)oxides formed by the degradation of Ni-based molecular structures on OER is a challenging issue. The effect of electrolyte impurity on OER in the presence of metal coordination compounds is rarely investigated. In this study, five important questions are considered regarding OER in the presence of a Ni coordination compound: (i) In which potential does the coordination compound start to be decomposed? (ii) After how many CVs does the decomposition occur? (iii) What is the effect of Fe impurity on OER in the presence of the Ni coordination compound? (iv) What is the product of the decomposition of the Ni coordination compound? (v) What is the true catalyst for OER in the presence of the Ni coordination compound? The roles of both the Fe impurity in the electrolyte and the Ni (hydr)oxide formed in the presence of a Ni coordination compound are investigated. The experiments showed that in the presence of the Ni coordination compound, Ni (hydr)oxide and Fe impurity in KOH formed a Ni–Fe oxide-based catalyst during OER, which is an efficient catalyst for OER. Fe impurity is a key contributor to observing OER in the presence of this Ni coordination compound.

Adres publiczny

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