

Abstract:

In spite of the challenges, electro-catalytic water splitting is widely regarded as one of the most environmentally friendly sustainable energy generation processes. Severe difficulties due to slow kinetics happening at the anode in oxygen evolution reaction (OER) activity for MOFs. Herein, sol gel and hydrothermal synthesis of MOFs with Gallic acid and TMA as organic linkers through metal salts of copper, iron, cobalt and nickel respectively is presented. Cyclic voltammetry (CV), Linear sweep voltammetry (LSV) and Electrochemical impedance spectroscopy are only a few of the analytical methods used to determine the defined nature of each synthetic material. While used as an OER electro-catalyst, these synthetic materials demonstrated exceptional OER activity in comparison to top-tier catalytic materials. Based on the electrochemical experiments, it was shown that the unique NiMOF/NF, FeMOF/NF and CuMOF/NF commences OER at the lowest onset potential value of 1.40V , 1.64V and 1.35V vs. RHE respectively, with a realised current density of 10 mA/cm² as well as of 5 mA/cm² at a lower overpotential. A low charge resistance in EIS value of 39.7 and 0.0093 is also computed for CoMOF/NF at 0V and 0.6V respectively. According to the results of a LSV study, once the novel electrocatalyst was created, it exhibited high activity in its catalytic performance of the OER process for more than 24 hours. The nanobead-array-like shape of NiMOF/NF, which gives more exposed active sites and enables the synergistic interaction between Bare/NF and FeCoNiMOF/NF, may be the major reason why this material is such a potent HER electrocatalyst. In addition, this study sheds light on the importance of metal fabricating activity with organic linker is used in optimising the efficiency of transition metal oxide-based energy conversion systems.