Abstract:

Electrocatalytic water splitting is considered as one of the best sustainable energy generation methods due to its environment friendliness but economically it faces serious challenges due to sluggish kinetics occurring at anode in oxygen evolution reaction (OER) activity. Herein, Zn-doped Fe_2O_3 (10% Fe_2ZnO_3/NF) synthesized via sol-gel method. All the synthesized materials are characterized via different analytical techniques such as X-ray diffraction analysis, scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). These fabricated materials are employed as an OER electrocatalyst, which executed superb OER activity as compared to the state-of-the-art catalytic materials. The electrochemical measurements revealed that novel 10% Fe_2ZnO_3/NF initiates OER at lowest onset potential value of 1.48V *Vs.* RHE, achieved current density of 10 $mAcm^{-2}$ at lower overpotential of 265mV and modest tafel slope value of 68mV dec^{-1} is calculated. The chronoamperometric analysis disclosed that as-prepared novel electrocatalyst demonstrated long term durability of more than 24 hours while catalyzing OER process. The superb intrinsic catalytic activity of 10% Fe_2ZnO_3/NF may be mainly due to its nanobeads arrays like morphology that provides more exposed active sites as well as facilitates the synergistic effect between Fe and Zn resulting to the robust highly efficient OER electrocatalyst than others. Moreover, this research gives the valuable insights about the role of metal doping in tuning the performance of energy conversion systems based on transition metal oxide.