Abstract

Electrochemical water electrolysis is a sustainable energy source for the generation of green hydrogen to meet global energy challenges. Since water splitting is a kinetically sluggish process so there is a need for the development of effective electrocatalysts to fasten the process of electrocatalytic water splitting. Although precious metal-based catalysts are efficient for overall water electrolysis, but these catalysts are not economical due to their rare availability and are expensive. Transition metal-based electrocatalysts are cost-efficient, abundantly available, and economical for energy generation from water electrolysis. Herein, NiFeW/Ni-foam electrocatalysts are synthesized by a simple reflux method as bifunctional electrocatalysts for complete water electrolysis. The as-synthesized catalysts are characterized by Energy dispersive X-ray spectroscopy, scanning electron microscopy, and electrochemical analysis. Electrochemical analysis results of the optimized catalyst NiFeW/Ni-foam show the low onset potential of 0.26 and 0.08 V for OER and HER respectively. It attains the current density of 10 mA cm^{-2} at a small overpotential of 20 and 320 mV for HER and OER respectively. The excellent and robust activity of NiFeW/Ni-foam is attributed to a large number of exposed active sites and its intrinsic activity that facilitates the synergic effect of Fe and W which ultimately results in the outstanding performance of the catalyst.