Abstract

It is the prime desire of renewable energy conversion technology to develop an effective an efficient electrocatalyst for the oxidation of water in alkaline media to generate clean fuel. Transition metal elements have been suggested as promising candidates for OER catalyst. This study reports the hydrothermal synthesis of nanocomposite of reduced graphene oxide and ruthenium doped nickel selenide ($NiRu_xSe$/rGO). The as synthesized nanocomposite is characterized by XRD, UV-Vis techniques. Particle size analysis shows the size of nanocomposite is around 78 nm. XRD pattern of the nanocomposite confirms that $NiRu_xSe$/rGO exhibited hexagonal crystal structures having high crystalline nature which increases with increasing the experimental temperature. In comparison with NiSe/rGO, $NiRu_xSe$/rGO displayed superior OER performance demanding 140 mV overpotential to afford current density of 10 mA cm^{-2} in alkaline media. The electrocatalyst exhibited a small tafel slop of 330 mV/dec and long term stability. This research establishes the fact that $NiRu_xSe$/rGO is an efficient OER catalyst and can be used as HER catalyst for hydrogen production.

Keywords: Oxygen evolution reaction, electrocatalysis, water splitting, ruthenium doped nickel selenide.