Abstract

To overcome the energy crises and meet the demand of future renewable energy, hydrogen is environmentally friendly fuel with zero carbon emission and greater energy density. Among various hydrogen production methods, water electrolysis is efficient and sustainable method to obtain pure hydrogen. The development of electrocatalyst for water splitting is an emerging field. Precious metals are used as electrocatalyst but these are expensive and not easily available which impedes their practical utilization at industrial scale. However, non-precious metals are easily available, cheaper and eco-friendly with greater electrocatalytic performance and electrical conductivity almost parallel to noble metals. Transition metal chalcogenides have been explored as effective electrocatalyst due to tunable characteristics, high stabilities, high activities, low band gap, high efficiencies, low electronegativity, high surface area, structural diversity as well as they are easily available at cheaper rates. Nickel selenides have best catalytic proficiency among nickel chalcogenide due to low resistivity, greater degree of covalency and smaller band gap. In this work, we have synthesized Nickel selenide based electrocatalyst through in situ selenization on the nickel foam. The nickel foam which is used acts as nickel source as well as conductive substrate which promotes the excellent electronic conductivity of electrocatalyst. The $NiCo_{0.02}Se_{0.5}$ /NF have shown excellent HER and OER catalytic activity with 104 mV and 160 mV overpotentials respectively to obtain current density of $50mAcm^{-2}$ The synergistic effect is present between $Co_{0.02}Se_{0.5}$ and NiSe which leads to electronic modulation, metallic conductivity and greater exposure to active sites. So, this work provides a superficial method to develop heterogenous catalysts for electrochemical energy conversion.