

Abstract

With water splitting regarded to be one of the cleanest, cheapest eco-friendly, and retrofitted to produce hydrogen, it is a suitable candidate resource for effective energy storage and generation. Nevertheless, the production of a cheap and effective catalytic material for the oxygen evolution process (OER), as opposed to the traditional accelerators that are predominantly centered on precious metals is essential to meet demands of the business with electrolysis-generated hydrogen. The catalytic material must becost effective, durable, and long-lasting catalystfor practical water splitting to satisfy the need for energy. All the researchers accepted hydrogen gas as fuel, energy source, and conveniently portable energy benign due to its high energy density, furthermore, this fuel does not emit any type of carbonaceous gases to the environment. High-efficiency yet inexpensive electrocatalysts that have the potential to speed up the sluggish hydrogen evolution reaction (HER) and oxygen evolution reaction are the key driving forces behind large-scale hydrogen synthesis by electrolytic splitting of water (OER). The baseline electrocatalysts for the HER and OER reactions are recognized to be the precious metals such as Ru, Pt, Ir, and Pd, as well as their oxides. These corrosion inhibitors are rarely employed as electrocatalysts due to their scarcity and elevated cost. To replace these precious metals, some other metals can be employed like lanthanide and actinide series, here in, Indium selenide doped with nickel is prepared as an electrocatalyst for water splitting using a hydrothermal synthesis approach. Synthesized material Ni@InSe was successfully characterized by cyclic voltammetry, X-ray diffraction, electrochemical surface area, electrochemical impedance spectroscopy, and chronoamperometry. This synthesized catalyst exhibited excellent catalytic activity towards OER in basic media. Ni@InSe exhibited a small overpotential of 116 mV @ 10 mA/s² current density with a low Tafel slope and 100 h stability in 1.0 M KOH electrolyte. These exceptional results are due to the highly crystalline material, high number of active sites, high electrical conductivity, and porosity.