

Enhancement of the Behavior of a Species of NiHcd HER Electrode Using a Stable Ni(OH)₂-NiOOH Phase Transformation Redox Mediator in a Developed-Two-Step Alkaline Electrolysis Process Under Variable Current Densities

Sethi, Jaskaran

Taneja, Aparimeya

An Experimental Study of the Enhanced Behaviour of a species A SPECIFIC COMPOSITION SPECIE OF COMMERCIALY VIABLE crack-and-pore NiHCd HER Electrode(56.3 wt.% of nickel and 43.7 wt.% of cobalt.) which manifest a synergism between the properties of nickel (high catalytic activity) and cobalt (high hydrogen adsorption),and our improved version of solid-state Ni(OH)₂/NiOOH /MWCNT electrode as a recyclable redox mediator.This also the first time that the effect of an induced redox mediator in a two-step alkaline electrolysis was studied on a particular combination of NON-PRECIOUS HER ELECTRODES and AN IMPROVED Ni(OH)₂/NiOOH / MWCNT composite electron-coupled proton buffer(intercalation & deintercalation of H⁺) to separately produce H₂ and O₂ without any membrane, thus reducing the cost and without having the HER to interfere with specific capacity of the charge-discharge curve of Ni(OH)₂ & NiOOH, while ensuring the separate generation of highly pure H₂ and O₂ with no membrane prevents the product gases from mixing over a range of current densities and simplifies the gas handling without the need for equal pressures on electrodes, which greatly increases the operation flexibility.Also, here the separate H₂ and O₂ productions require different driving voltages(or power inputs) which implies that unlike that in one-step electrolysis we can flexibly use sustainable energy for H₂ production or O₂ production based on the output variation in these unstable power sources. According to driving voltages, the efficiency of this two-step water electrolysis is also~92% (=1.973/2.137) compared with its corresponding one-step water electrolysis. The achieved efficiency is slightly higher than that (79%) of the two-step PEM water electrolysis. The Faradaic efficiency is 94.7%(12/12.67).

Awards Won:

Third Award of \$1,000