

Porous Ni Electrodes Modified with Au Nanoparticles for Hydrogen Production

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Abstract : In this work new macroporous Ni electrodes modified with Au nanoparticles for hydrogen production have been developed. The supporting macroporous Ni electrodes have been obtained by means of the electrodeposition at high current densities. Then, the Au nanoparticles were synthesized and added to the electrode surface. The electrocatalytic behaviour of the developed electrocatalysts was studied by means of pseudo-steady-state polarization curves, electrochemical impedance spectroscopy (EIS) and hydrogen discharge curves. The size of the Au synthesized nanoparticles shows a monomodal distribution, with a very sharp band between 10 and 50 nm. The characteristic parameters d_{10} , d_{50} and d_{90} were 14, 20 and 31 nm respectively. From Tafel polarization data has been concluded that the Au nanoparticles improve the catalytic activity of the developed electrodes towards the HER respect to the macroporous Ni electrodes. EIS permits to obtain the electrochemically active area by means of the roughness factor value. All the developed electrodes show roughness factor values in the same order of magnitude. From the activation energy results it can be concluded that the Au nanoparticles improve the intrinsic catalytic activity of the macroporous Ni electrodes.

Keywords : Au nano particles, hydrogen evolution reaction, porous Ni electrodes, electrochemical impedance spectroscopy

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