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# HYDROGEN GENERATION FROM Co Ni-BASED CATHODES DEVELOPED FROM WASTED NIMH BATTERIES.

Currently, there is a significant dependence on fossil fuels, which are non-renewable. When these fuels are used in combustion processes, they generate greenhouse gases that contribute to climate change. Accordingly, it is crucial to develop more environmentally friendly energy sources enabling to underpin futures demands. In this context, hydrogen stands out as an attractive alternative due to its high energy density (140 MJ/kg) and its clean byproducts, producing only water and energy when burned [1]. There are various methods to produce hydrogen, with water electrolysis being one of the most notable, as it can be powered by renewable sources such as solar and wind energy. Co Ni-based electrodes are a promising option for the hydrogen evolution reaction (HER) due to their low overpotential, stability in alkaline media, and good electrical conductivity. Utilizing discarded NiMH batteries is an interesting approach, as one of their main components is nickel, adding value and preventing them from becoming pollutants. In this research, Co-Ni-based electrodes were obtained from leachates of discarded NiMH batteries, which were subsequently used to catalyze the HER. For this purpose, the leaching liquors from the batteries were recovered, and deposits were generated using the pulsed current technique (PP). This was done on carbon steel supports, employing current densities of -100 mAcm-2 and -55 mAcm-2, with charges of 6 C and 11 C, and a 50% duty cycle. The electrodes were characterized using scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX) to determine their morphology and elemental composition. The performance of the electrodes was electrochemically evaluated using techniques such as linear sweep voltammetry (LSV) and electrochemical impedance spectroscopy (EIS), employing KOH as the electrolyte. The results indicated that Co-Ni-based deposits with different characteristics can be successfully applied to develop macroscopic applications of green hydrogen production.

### Keywords

Hydrogen production, Nickel, Water electrolysis, Electrodeposited nickel electrode, Electrocatalysis

### Reference

[1] Chi, Jun, and Hongmei Yu. "Water electrolysis based on renewable energy for hydrogen production." Chinese Journal of Catalysis 39.3 (2018): 390-394, https://doi.org/10.1016/S1872-2067(17)62949-8.

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### Author approval

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