Study on Ni/MH Composite Plating and Its Performance for Hydrogen Evolution Reaction

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In order to improve the hydrogen evolution stability of nickel electrodes, this paper prepares a composite nickel-plated/hydrogen storage alloy (Ni/MH) electrode and investigates its hydrogen evolution performance in alkaline aqueous solutions. Characterization results such as scanning electron microscopy (SEM), X-ray diffraction (XRD) and energy dispersive spectrometer (EDS) indicate that the hydrogen storage alloy particles have been uniformly deposited inside and on the surface of the nickel plating, and that pores exist on the electrode surface. The linear sweep voltammetry (LSV) at room temperature shows that the overpotential of the Ni/MH composite electrode is 196 mV when the current density reaches 50 mA·cm⁻² and 231 mV when the current density reaches 100 mA·cm⁻². The tafel slope of 100 mV·dec⁻¹, which performs much better than nickel-plated electrodes. Chronopotentiometry (CP) showed that the potential response of the Ni/MH composite electrode was very stable and comparable to that of the Pt electrode, while the Ni electrode polarization continued to increase. Electrochemical impedance spectroscopy (EIS) tests confirmed that the Ni/MH composite electrode had a low charge transfer resistance. In summary, the results show that composite plating with hydrogen storage alloy significantly improves the hydrogen evolution catalytic performance of nickel electrodes and has a broad application prospect.

Keywords: Composite nickel/hydrogen storage alloy electrode; Catalytic activity of hydrogen evolution; Stability; Overpotential

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