

Article

Electrochemical Performance of a Hybrid NiCo₂O₄@NiFelt Electrode at Different Operating Temperatures and Electrolyte pH

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Electrochemical Active Surface Area (ECSA) Calculation

The electrochemical active surface area (ECSA) is one of the important factors that is calculated to give a better insight into the activity of NiCo₂O₄ when it is hybridized with a NiFelt electrode. To do this, the double-layer capacitance (C_{dl}) was determined using cyclic voltammetry (CV) in a region free of Faradaic processes, for both NiCo-Hg (Figure 1S) and NiFelt-Hg (Figure 2S) in 1M KOH and temperature of electrolyte at 20 °C. For all electrodes, the potential range was set between 0 and 0.3 V vs. RHE. Various scan rates starting from 100 mV s⁻¹ to 400 mV s⁻¹ were examined to determine the C_{dl} by calculating the linear relationship between current density and scan rate and results are given at the Figure 3S. These values were obtained by measuring the difference between cathodic and anodic currents at each scan rate, plotted against the scan rate, and fitting a linear model at 0.2 V vs. RHE. The slope of this plot represents the C_{dl} for each electrode. The ECSA for each electrode was obtained by using equation 1S by considering the C_s as specific capacitance of a smooth and flat surface is 0.04 mF/cm². the results are given in table 1S, electrodes with higher C_{dl} values exhibit higher ECSA.

$$ECSA = \frac{C_{dl}}{C_s} \quad (S1)$$

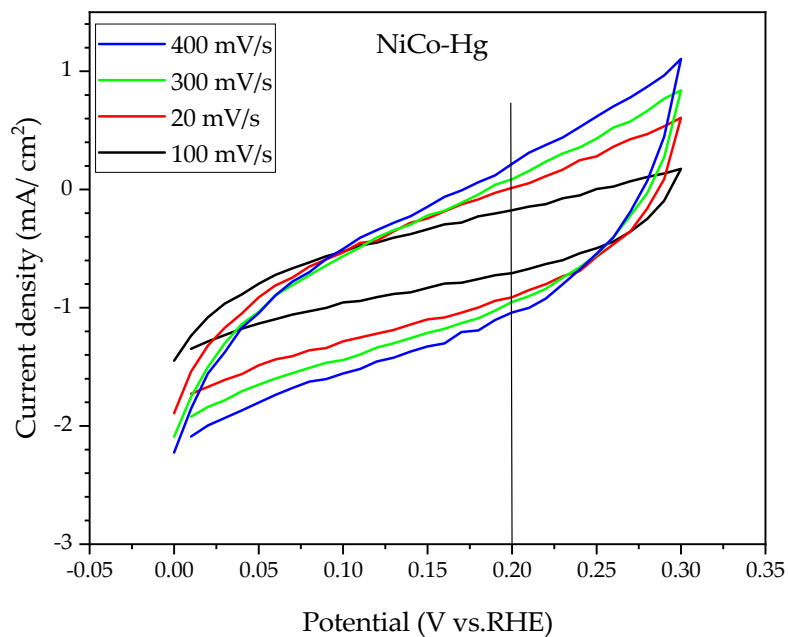


Figure S1. Cyclic Voltammetry of NiCo_2O_4 with Hg/HgO reference electrode with a different scan rate.

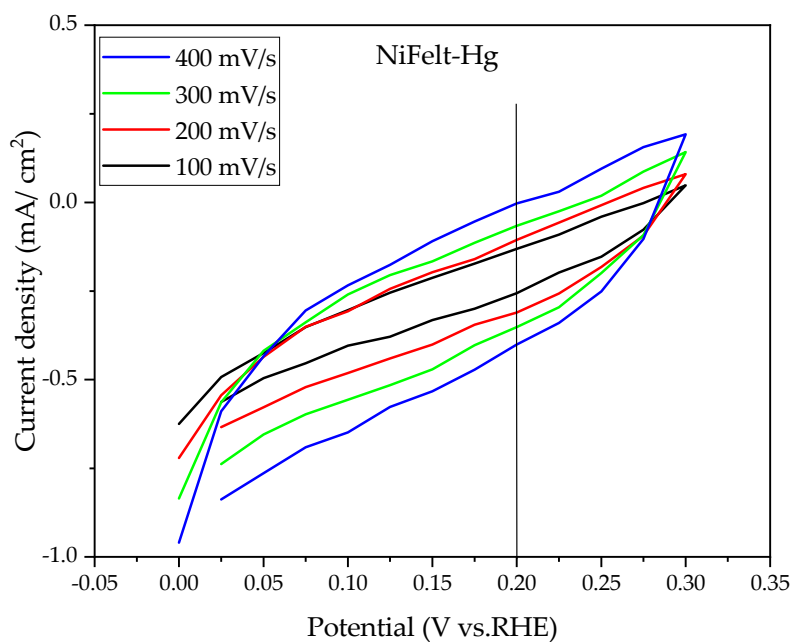


Figure S2. Cyclic Voltammetry of NiFe with Hg/HgO reference electrode with a different scan rate.

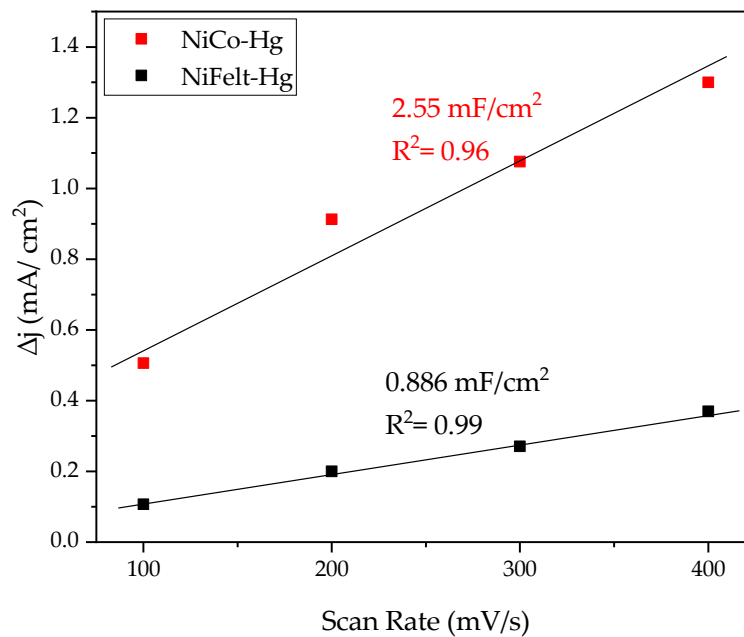


Figure S3. Capacitance double layer calculation at 200 mV potential vs. RHE for NiCo₂O₄@NiFelt and bare NiFelt.

Table S1. ECSA calculation for NiCo-Hg and NiFelt-Hg.

Electrode Name	Cdl (mF/cm ²)	ECSA (cm ²)
NiCo-Hg	2.55	63.75
NiFelt-Hg	0.886	22.5