Supplementary Information

Synergistic Effect of Urchin-Like NiCo$_2$O$_4$/SnS$_2$ Nanocomposites toward Stable Lithium-Ion Storage

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CIP file of NCO

The crystallographic information of NCO from Materials Project database (ID: mp-1096547). With CIP file

Co2NiO4 (2).cif

Pseudocapacitive contribution and b-value analysis

Determination of capacitive and diffusion-controlled charge-storage contributions derived from CV curves recorded over a potential window of 0–3 V. The analysis was performed at selected potentials corresponding to the main anodic and cathodic redox peaks (Peak 1–Peak 3), which remain well resolved and stable across scan rates ranging from 0.2 to 1.4 mV s^{-1}. CV data collected at scan rates from 0.2 to 1.4 mV s^{-1} were used for the analysis. For each scan rate, the square root of the scan rate ($v^{1/2}$), the measured current i(V), and the normalized current $i(V)/v^{1/2}$ were calculated to determine the fitting parameters k_1 and k_2, representing the capacitive-controlled (k_1v) and diffusion-controlled ($k_2v^{1/2}$) current contributions, respectively.

Percentage contribution was calculated by using following equation.

$$\text{Capacitive contribution (\%)} = \frac{k_1 v}{k_1 v + k_2 v^{1/2}} \times 100$$

$$\text{Diffusion contribution (\%)} = \frac{k_2 v^{1/2}}{k_1 v + k_2 v^{1/2}} \times 100$$

The fitting intervals for the b-value analysis were defined by selecting the main anodic and cathodic redox peaks (Peak 1–Peak 3) that remain well resolved and stable across scan rates ranging from 0.2 to 1.4 mV s^{-1}, as observed in the CV curves. The corresponding peak current values extracted at these consistent redox potentials were subsequently used to construct the log(i) versus log(v) plots, and linear fitting was performed to obtain reliable b-values while minimizing noise-related deviations as seen in Fig. 8d.

Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	0.00136	8.17954E-4	0.00102
Pearson's r	0.99897	0.99557	0.96398
Adj. R-Square	0.9969	0.98674	0.89389
		Value	Standard Error
B	Intercept	0.32064	0.01523
B	Slope	0.85518	0.04075
D	Intercept	0.01026	0.01182
D	Slope	0.47355	0.03162
F	Intercept	0.4254	0.01321
F	Slope	0.18118	0.03535

Legend: Peak 1, Peak 2, Peak 3

Axes: log (Peak current, mA) vs log (Scan rate, mV/S)