Design and Synthesis of 3D Interconnected Mesoporous NiCo₂O₄@Co_xNi_{1-x}(OH)₂ Core-Shell Nanosheet Arrays with Large Areal Capacitance and High Rate Performance for Supercapacitors

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Calculations: The discharge specific capacitance (C_{sp}) or areal capacitance (C_a) in the three-electrode was calculated from the discharge curves using the following equation:^[1] $C_{sp} = \text{It/m}\Delta V$ and $C_a = \text{It/S}\Delta V$, where I (A) is the current used for the charge/discharge, t (s) is the discharge time, m (g) is the total weight of the active electrode, ΔV (V) is the voltage interval of the discharge, and *S* is the geometrical area of the electrode.

The power density and energy density are calculated from the following equations, respectively:^[2] $E = 0.5C\Delta V^2$, P = E/t, where E (Wh/kg) is the energy density, P (kW/kg) is the power density, C (F/g) is the specific capacitance, ΔV (V) is the potential window of discharge, and t (s) is the discharge time.



Figure S1. (a) SEM image of the treated Ni foam by HCl.



Figure S2. TEM image of the NiCo₂O₄ ultrathin nanosheet.



Figure S3. XRD pattern of the Co_xNi_{1-x}(OH)₂ material on the carbon cloth.

In order to reduce the impact of the NiCo₂O₄ nanosheets and Ni foam, we deposited pure $Co_xNi_{1-x}(OH)_2$ on carbon cloth, the XRD shows that the pure $Co_xNi_{1-x}(OH)_2$ material contains α -Co(OH)₂ and α -Ni(OH)₂ phase (JCPDS 74-1057 and 38-0715), which is consistent with previously reports.^[3,4]



Figure S4. CD curves of the hierarchical mesoporous $NiCo_2O_4@Co_xNi_{1-x}(OH)_2$ coreshell nanosheet electrodes at different current densities, (a) x = 0.67, (b) x = 0.5, (c) x = 0.33.



Figure S5. (a) CD curves and (b) specific capacitance of the hierarchical mesoporous $NiCo_2O_4@Co_{0.5}Ni_{0.5}(OH)_2$ core-shell nanosheet arrays as a function of the $Co_{0.5}Ni_{0.5}(OH)_2$ electrodeposition time.



Figure S6. (a) CV curves of the $NiCo_2O_4@Co_{0.33}Ni_{0.67}(OH)_2//CMK-3$ -ASC device with different masses. (b) The corresponding specific capacitances as a function of total mass.



Figure S7. CV curves of the $NiCo_2O_4@Co_{0.33}Ni_{0.67}(OH)_2//CMK-3-ASC$ device at different scan voltage windows.

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