Supporting Information

Conformal Coating of $Ni(OH)_2$ Nanoflakes on Carbon Fibers by Chemical Bath Deposition for Efficient Supercapacitor Electrodes

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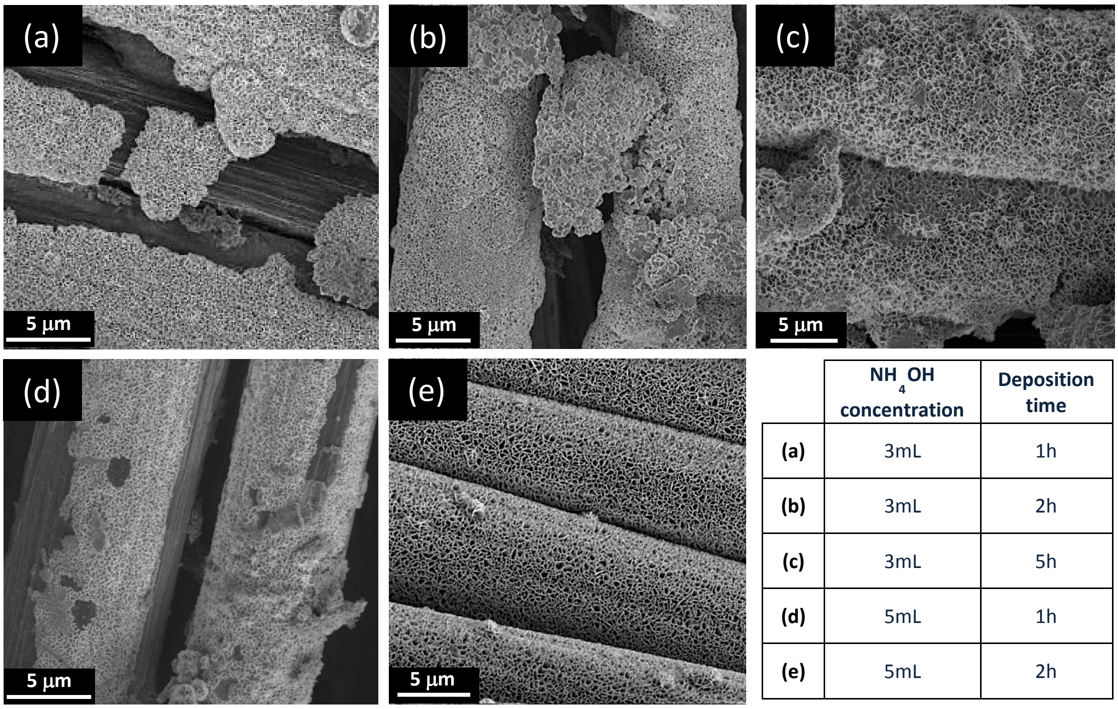
KEYWORDS: Conformal electrodes, Nickel hydroxide, Fibrous carbon fabrics, Chemical bath deposition, Interconnected nanoflakes, Supercapacitor, Specific capacitance.



	NH_4OH concentration	Deposition time
(a)	3mL	1h
(b)	3mL	2h
(c)	3mL	5h
(d)	5mL	1h
(e)	5mL	2h

Figure S1. SEM images of $Ni(OH)_2$ nanoflakes on fibrous carbon fabric prepared at different synthetic conditions as indicated on the table.

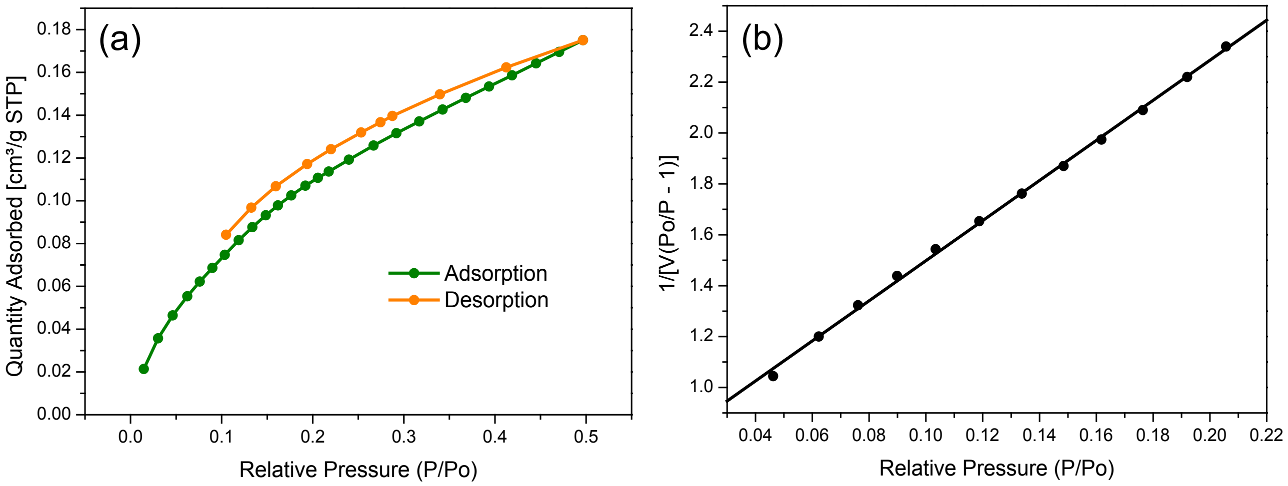


Figure S2. (a) Krypton adsorption/desorption isotherm, and (b) BET surface area plot of conformal $Ni(OH)_2$ nanoflakes on fibrous carbon fabric.

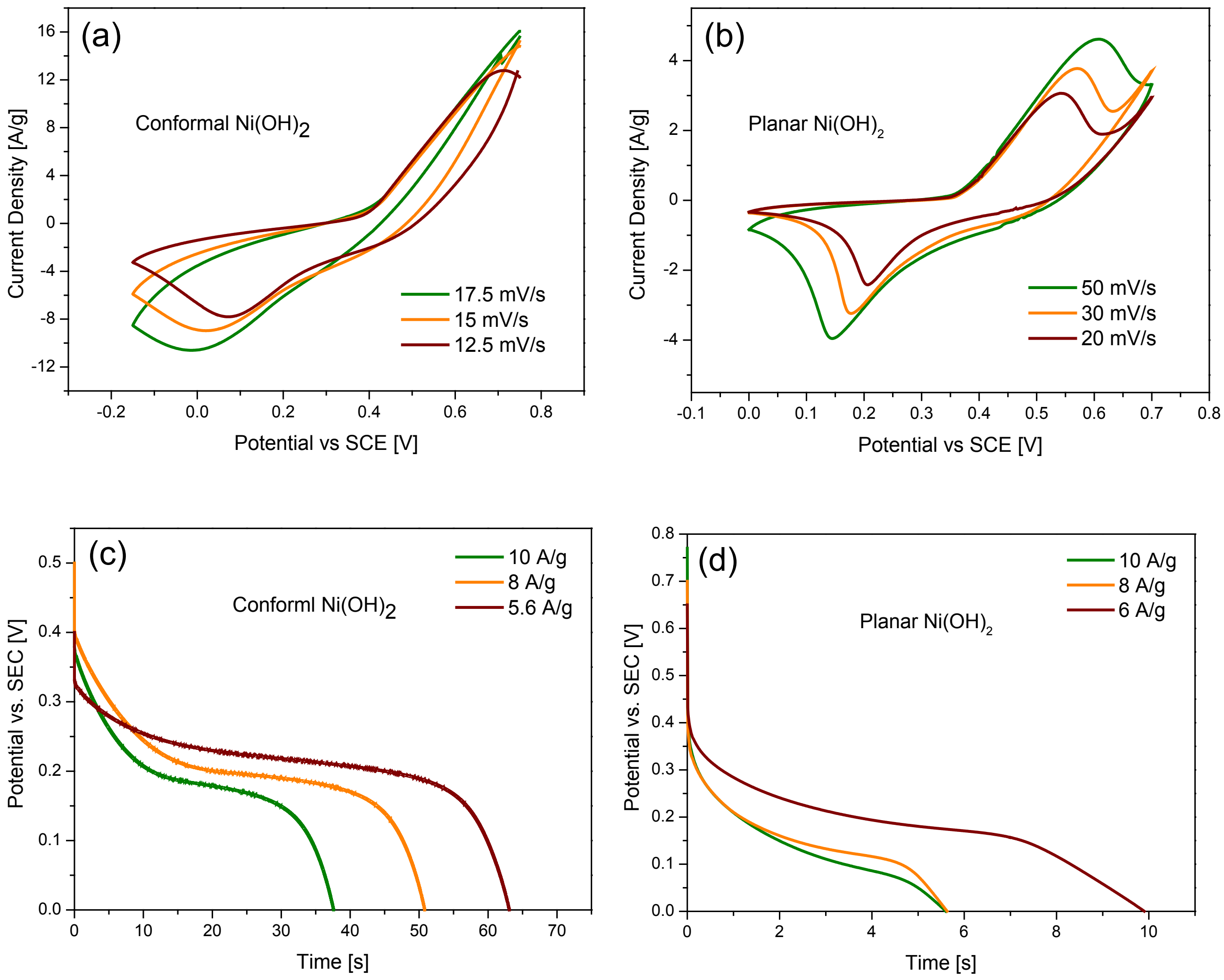


Figure S3. CV plots of (a) conformal $Ni(OH)_2$ electrode, (b) planar $Ni(OH)_2$ electrode, both at higher scan rates. Discharge curves of (c) conformal $Ni(OH)_2$ electrode, (d) planar $Ni(OH)_2$ electrode, both at larger current densities.

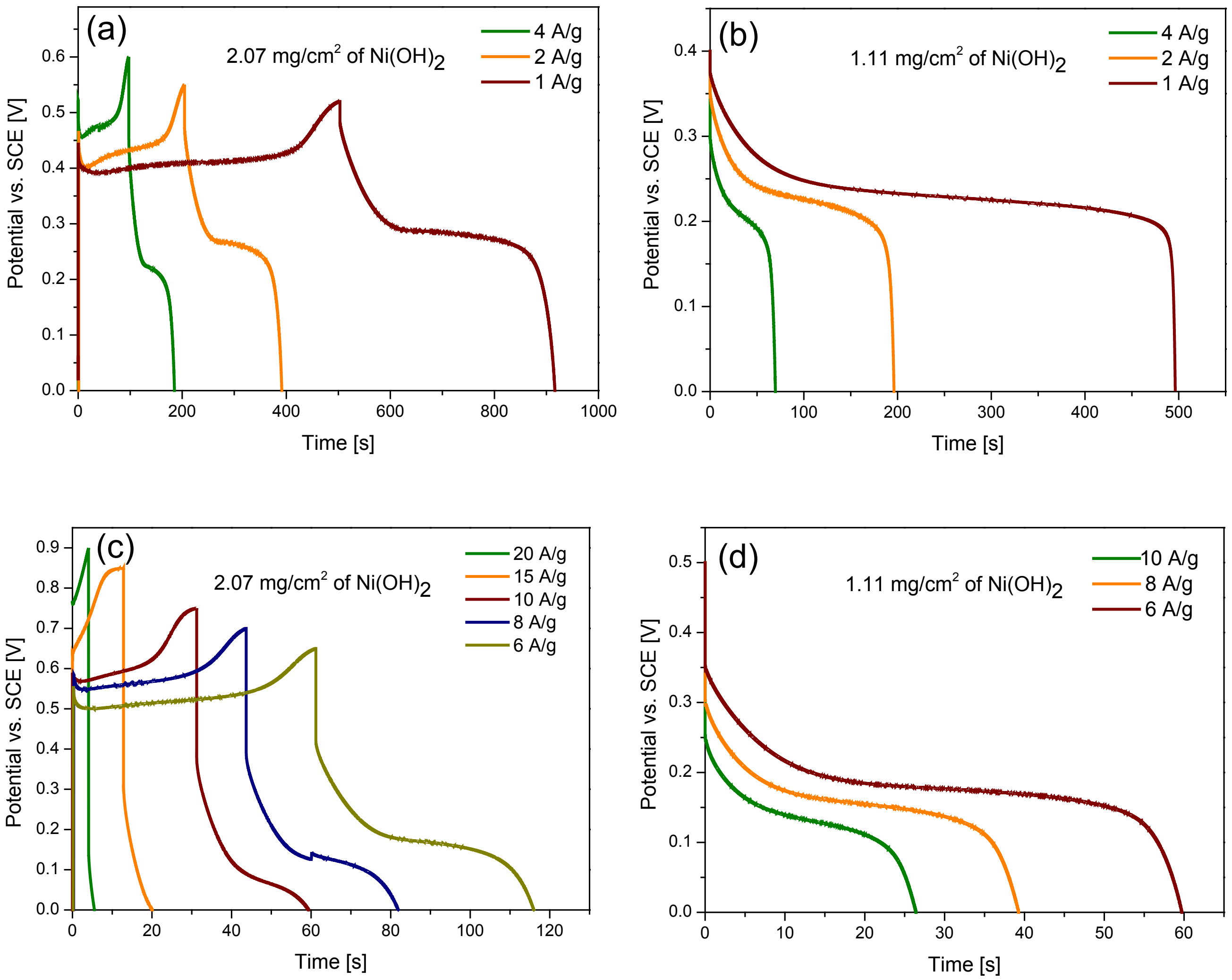


Figure S4. (a) and (c) charge-discharge plots of conformal $Ni(OH)_2$ electrode containing 2.07 mg/cm^2 of $Ni(OH)_2$ at different current densities.(b) and (d) discharge plots of conformal $Ni(OH)_2$ electrode containing 1.11 mg/cm^2 of $Ni(OH)_2$ at different current densities.

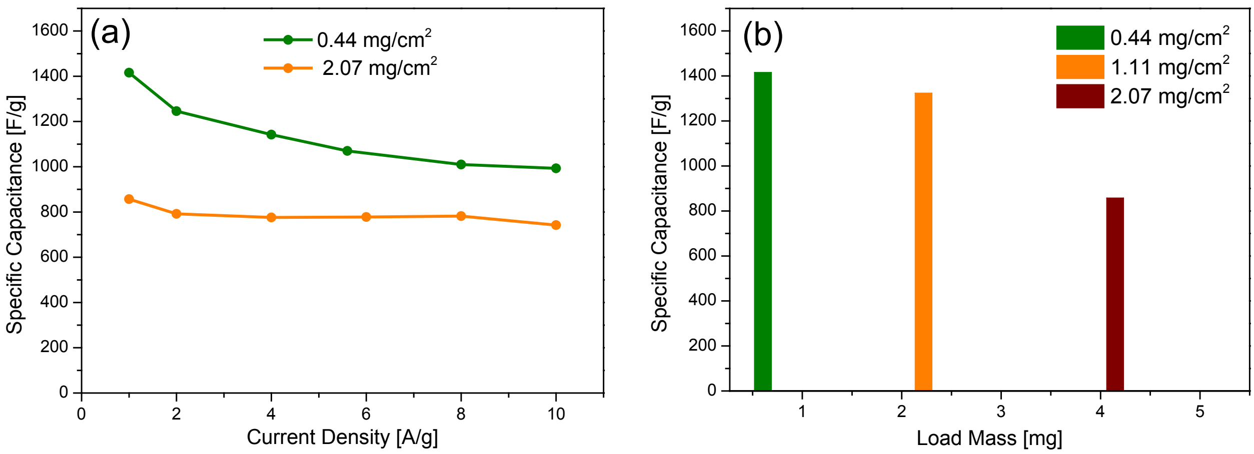


Figure S5. Specific capacitance (a) as a function of current densities for conformal $Ni(OH)_2$ electrodes with different mass loadings, and (b) as a function of mass loading for conformal $Ni(OH)_2$ electrodes.

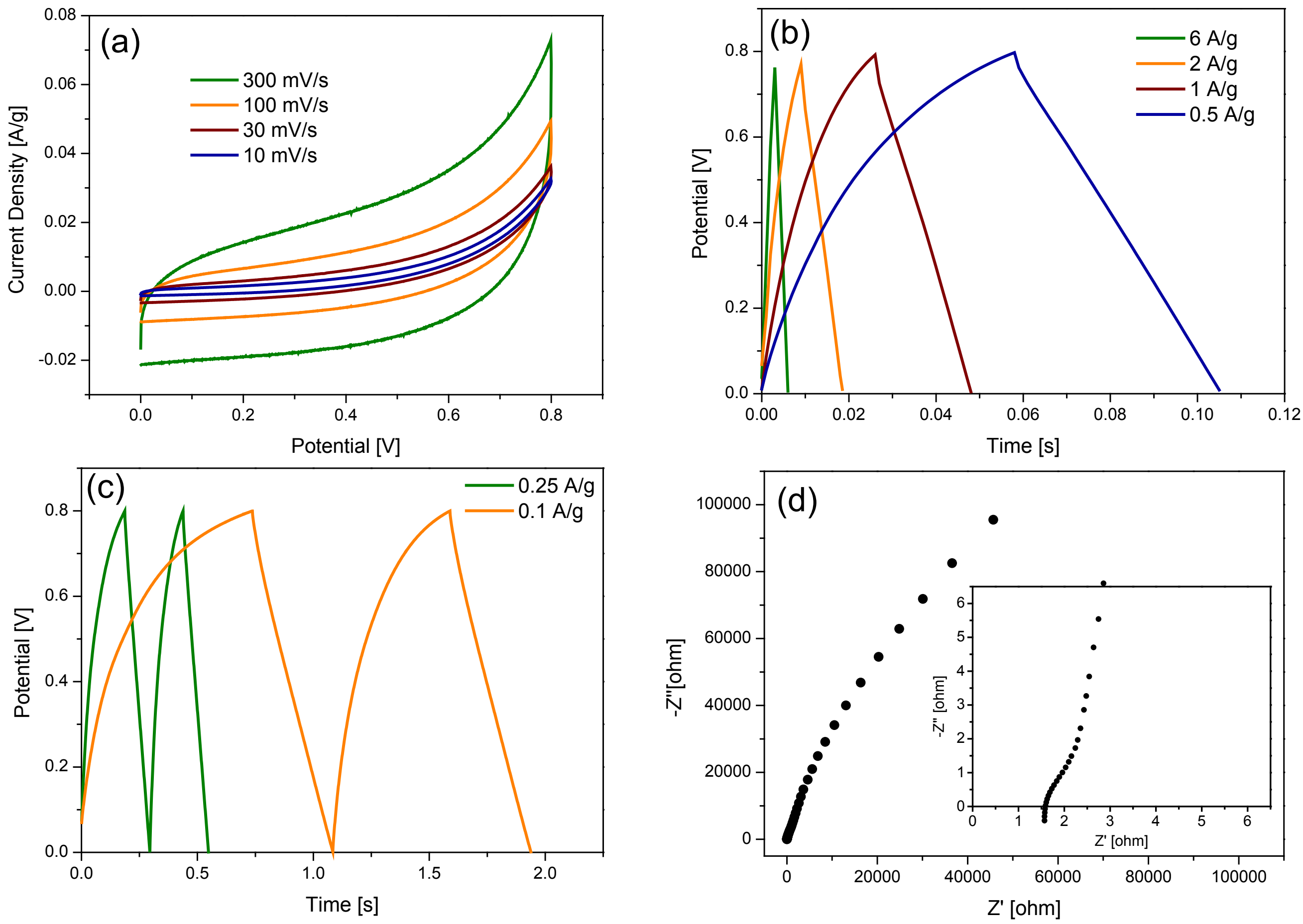


Figure S6. Two-electrode measurements of fibrous carbon fabric based symmetric supercapacitor (a) CV curves at different scan rates. (b) discharge curves at higher current densities. (c) discharge curves at lower current densities. (d) Nyquist plots with an enlarged scale in the inset.

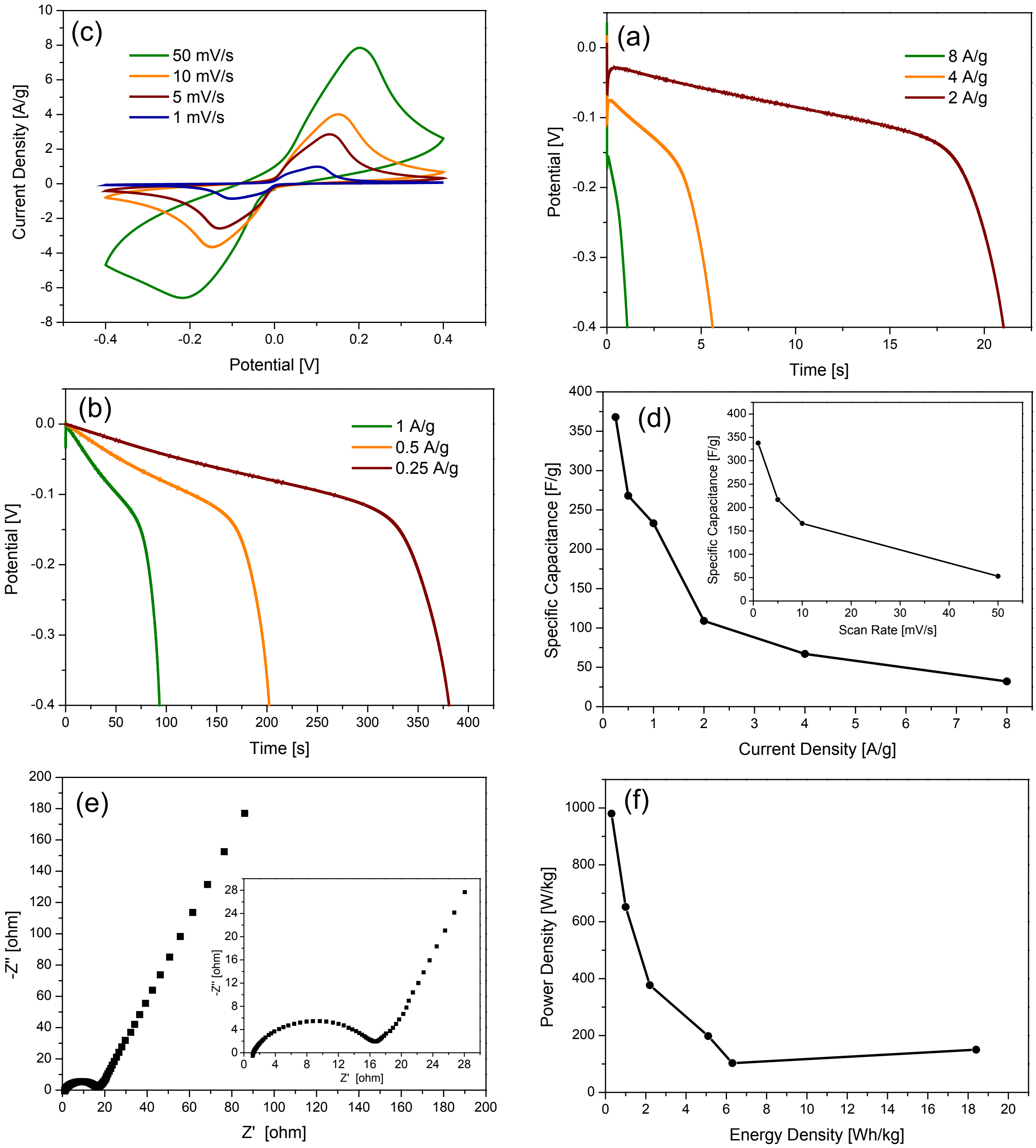


Figure S7. Two-electrode measurements of conformal $Ni(OH)_2$based symmetric supercapacitor (a) CV curves at different scan rates. (b) discharge curves at higher current densities. (c) discharge curves at lower current densities. (d) specific capacitance as a function of current densities (and as a function of scan rate in the inset). (e) Nyquist plots with an enlarged scale in the inset. (f) Ragone plot. The mass loading per unit of area is 1.67 mg/cm^2 of $Ni(OH)_2$ on each electrode.

Electrochemical performance calculations:

The specific capacitance (C_s) of an electrode in half-cell configuration (3-electrode measurements), as a function of scan rates, was calculated from CV curves by applying the equation:

$$C_s = \frac{\int i dv}{m \, \Delta V \frac{dv}{dt}} \tag{1}$$

where i is variable current [A], m is the mass of one electrode's active materials [g],ΔV is discharge voltage [V] and dv/dt is scan rate [V/s]

The specific capacitance of an electrode in half-cell configuration (3-electrode measurements), as a function of current densities, was calculated from discharge curves by applying the equation:

$$C_s = \frac{I \, \Delta t}{m \, \Delta V} \tag{2}$$

where I is constant current [A], Δt is discharge time [s],m is the mass of one electrode's active materials [g], and ΔV is discharge voltage [V].

It is noticed in the literature that specific capacitance values calculated from CV curves are usually higher than those values calculated from discharge curves. In this study, the results of both calculation methods indicated that conformal $Ni(OH)_2$ electrode exhibited specific capacitances significantly higher than that of planar $Ni(OH)_2$ electrode.

The specific capacitance of an electrode in full-cell configuration (2-electrode measurements), as a function of scan rates, was calculated from CV curves by applying the equation:

$$C_s = \frac{2 \, Q}{m \;\; \Delta V} \tag{3}$$

where Q is the charge of the discharge curve [C], m is the mass of one electrode's active materials [g], and ΔV is discharge voltage [V].

The specific capacitance of an electrode in full-cell configuration (2-electrode measurements), as a function of current densities, was calculated from discharge curves by applying the equation:

$$C_s = \frac{2\,I\,\Delta t}{m\,\Delta V} \tag{4}$$

Where all parameters as as same as those of equation (2)

The energy (E) and power (P) densities of an electrode in full-cell configuration (2-electrode measurements), were calculated by applying the equations:

$$E = \frac{1}{2} C_s \Delta V^2 \tag{5}$$

$$P = \frac{E}{\Delta t} \tag{6}$$

where C_s is specific capacitance calculated from discharge curves, ΔV is discharge voltage [V] and Δt is discharge time [s].