Supporting Information for

WO$_3$ nanoflowers with excellent pseudo-capacitive performance and the capacitance contribution analysis

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Calculation methods

Single electrode

For a single electrode, its areal and gravimetric capacitance $C_s$ and $C_g$ can be calculated from the CV curves through the following equation:

$$C_s = \frac{\int IdU}{2vU_p} = \frac{S}{2vU_p}$$

$$C_g = \frac{\int IdU}{2vMU_p} = \frac{S}{2vMU_p}$$

where $v$ is the scan rate, $S$ is the area of the closed CV curve, $U_p$ is the potential window and $M$ is the mass loading of the active material. The area of the covered active material was controlled to be 1 cm$^2$.

The area capacitance $C_s$ of a single electrode based GCD curves can be calculated from the following equation:

$$C_s = \frac{\Delta Vt}{\Delta U}$$

where $I$ is the discharge current, $\Delta t$ is the discharge time, $\Delta U$ is the potential window.
Device

The area capacitance $C_d$ of the device was calculated from the CV curves:

$$C_d = \frac{\int \! I \, dU}{2vU_w} = \frac{S}{2vU_w}$$

where $v$ is the scan rate, $S$ is the area of the closed CV curve and $U_w$ is the voltage window.

The volumetric capacitance $C_v$ of device was calculated from the CV curves by the following equation:

$$C_v = \frac{\int \! I \, dU}{2vVU_w} = \frac{S}{2vVU_w}$$

where $v$ is the scan rate, $S$ is the area of the closed CV curve, $V$ is the volume of the whole device, and $U_w$ is the voltage window. The area of the covered active material was controlled to be 1 cm$^2$.

And the energy density and the average power density can be gained by employing the following equation:

$$E = \frac{C_vU_w^2}{2}$$

$$P = \frac{E}{t}$$

$$t = \frac{U_w}{v}$$

in which $C_v$ is the volumetric capacitance calculated before.
Figure S1 Positive and negative electrodes at a scan rate of 100 mV s\(^{-1}\), representing a proper capacitance ratio for asymmetric supercapacitor.
Figure S2 CV curve of WO$_3$ deposited on carbon cloth, inset shows pictures of pure carbon cloth and WO$_3$ on it.
Figure S3 Mass loading and gravimetric capacitance (at a scan rate of 100 mV s$^{-1}$) of the NFL-WO$_3$ electrode at different deposition time.
Figure S4 Positive and negative electrodes at a scan rate of 100 mV s\(^{-1}\), representing a proper capacitance ratio for asymmetric supercapacitor.
Figure S5 SEM images of the positive electrode. (a) SEM image of the TiO$_2$@C NWs, inset shows the magnified picture. (b) SEM image of the TiO$_2$@C@PPy electrode, inset shows the magnified picture.
Figure S6 Electrochemical performance of the TiO$_2$@C@PPy electrode. (a) CV curves of the TiO$_2$@C and TiO$_2$@C@PPy electrodes. (b) Nyquist plots of the TiO$_2$@C and TiO$_2$@C@PPy. (c) CV curves of the TiO$_2$@C@PPy electrode at different scan rates. (d) GCD curves of the TiO$_2$@C@PPy electrode at different current density.
Figure S7 Illustration about the application of tandem ASC devices charging a cellphone.