Supplementary Materials

In situ transformation of ZIF-67 into hollow $\text{Co}_2\text{V}_2\text{O}_7$ nanocages on graphene as high-performance cathode for aqueous asymmetric supercapacitors

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Calculation

The specific capacity ($Q$) of single electrode can be determined from GCD curves through formula:

\[ Q = \frac{I \times \Delta t}{m} \quad (S1) \]

where $\Delta t$, $I$, and $m$ are the discharge time, the charge-discharge current, and the potential range excluding IR drop in charge-discharge curves, and $m$ represents the mass loading of the working electrode.

For the ASC device, the mass ration of cathode and anode was determined by equation:

\[ \frac{m_+}{m_-} = \frac{Q_-}{Q_+} \quad (S2) \]

where $m$ and $Q$ represents the mass loading and capacity of cathode (+) and anode (-), respectively. The specific capacitance, energy density, and power density of ASC device were calculated by formulas:

\[ C_{cell} = \frac{I \times \Delta t}{m \times \Delta V} \quad (S3) \]

\[ E = \frac{1}{2} C_{cell} \Delta V^2 \quad (S4) \]

\[ P = \frac{E}{\Delta t} \quad (S5) \]

where $C_{cell}$, $\Delta V$, and $\Delta t$ are the corresponding parameters in discharge curves, and $m$ represents the total mass loading of two electrodes in ASC device.

![Fig. S1](image-url) (a) XRD patterns of GO, ZIF-67, and ZIF-67/G; (b) XRD patterns of Co$_2$V$_2$O$_7$/G.
Fig. S2 (a) elemental mapping image and (b) EDX spectrum Co$_2$V$_2$O$_7$/G.

Fig. S3 SEM of (a) ZIF-67 and (b) Co$_2$V$_2$O$_7$. 
Fig. S4 (a) CV curves of the Co$_2$V$_2$O$_7$ electrode at different scan rates; (b) linear relationship between the anodic/cathodic peak currents at the square root of the scan rates.

Fig. S5 GCD curves of (a) Co$_2$V$_2$O$_7$ and (b) Co$_2$V$_2$O$_7$/G electrodes at different current densities.

Fig. S6 (a) SEM and (b) XRD pattern of Co$_3$O$_4$/G composites.
Fig. S7 GCD curves of rGO electrode at different current densities.

Reference

