Tailoring Yolk-Shell FeP@Carbon Nanoboxes with Engineered Void Space for Pseudocapacitance-Boosted Lithium Storage

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Supporting Figures and Tables

Figure S1 XRD patterns of a) Fe$_2$O$_3$ nanocubes and b) Fe$_3$O$_4$@C nanocubes; SEM images of c, d) Fe$_2$O$_3$ nanocubes, e, f) core-shell Fe$_3$O$_4$@C nanocubes, and g, h) yolk-shell Fe$_3$O$_4$@C nanoboxes.
The detailed counting process of carbon content:

Based on the TGA results, the weight content of carbon in samples were estimated as follows:

\[ \text{FeP} \rightarrow \frac{1}{2} \text{Fe}_2\text{O}_3 + \frac{1}{2} \text{P}_2\text{O}_5 \]

\[ (1-x) \ 0.92 \ (1-x) \ 0.82 \ (1-x) \]

According to the previous reports, the FeP was finally oxidized to form Fe$_2$O$_3$ and P$_2$O$_5$ after TGA test under air atmosphere. Assuming the carbon content is x and the total mass is 1, thus the weight fractions for carbon can be calculated using the following formula:

YS-FeP@C: \[ 0.92 \ (1-x) + 0.82 \ (1-x) - x = 118\% \]

CS-FeP@C: \[ 0.92 \ (1-x) + 0.82 \ (1-x) - x = 126\% \]

Therefore, the carbon content in the YS-FeP@C and CS-FeP@C is estimated to be 20.2 % and 17.4 %, respectively.
Figure S2 The high-resolution N 1s XPS spectra of YS-FeP@C.
Figure S3 CV curves of a) YS-FeP@C and b) CS-FeP@C; Selected charge-discharge curves for the initial three cycles of c) YS-FeP@C and d) CS-FeP@C at a current density of 0.1 A g$^{-1}$. 

Figure S4 SEM images of a, b) YS-FeP@C and c, d) YS-FeP@C-2; e) The result of carbon content for all three samples; f) Rate performance comparison between YS-FeP@C and YS-FeP@C-2 electrodes from 0.1 to 10.0 A g⁻¹.
Figure S5  a) CV curves of CS-FeP@C electrode at various scan rates from 0.2 to 5.0 mV s\(^{-1}\); b) Capacitive contribution of CS-FeP@C electrode at a scan rate of 1.0 mV s\(^{-1}\); c) Contribution ratio of the capacitive and diffusion-controlled capacity versus scan rate of CS-FeP@C electrode.
Figure S6 a) Equivalent circuit model for FeP@C composites; b) the $Z' - \omega^{1/2}$ curves of YS-FeP@C and CS-FeP@C electrodes in the low-frequency region.
Figure S7 The charge-discharge curves for 25th and 150th cycles of YS-FeP@C at a current density of 1.0 A g⁻¹.