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Electronic Supplementary Information (ESI)

FeO_x@carbon yolk/shell nanowires with tailored void spaces as stable and high-capacity anodes for lithium ion battery

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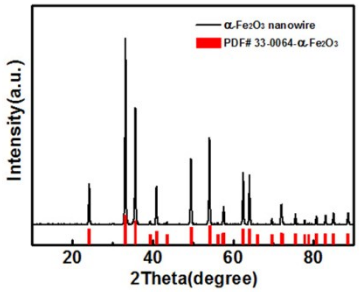


Fig. S1 The XRD pattern of α-Fe_2O_3 nanowires

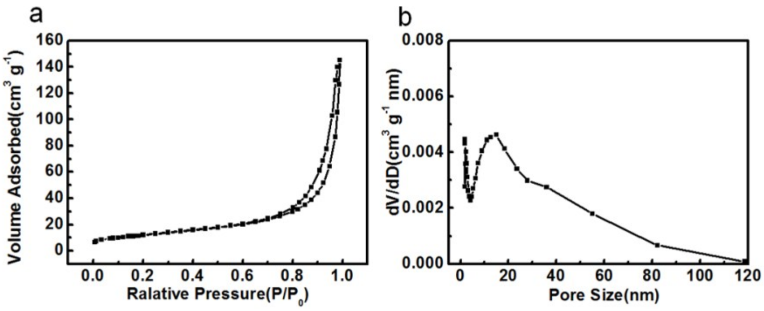


Fig. S2 (a) N_2 adsorption-desorption isotherms profile of α-Fe_2O_3 nanowires; (b) Pore size distribution of α-Fe_2O_3 nanowires

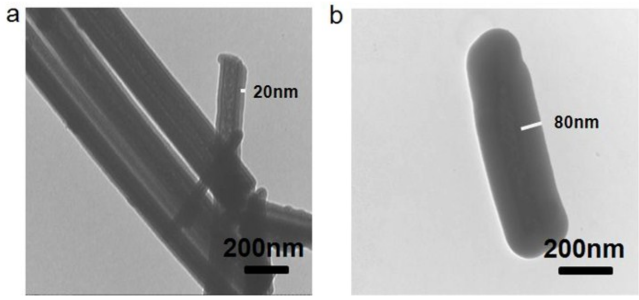


Fig. S3 α-Fe_2O_3@SiO_2 with different thickness of silica layer (a) 20nm; (b) 80nm

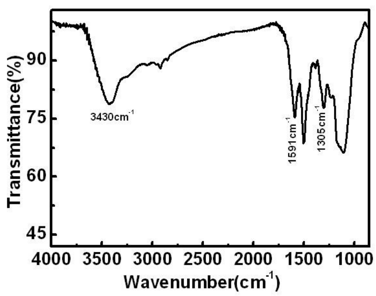


Fig. S4 The FT-IR spectra of α-Fe_2O_3@SiO_2@PAN

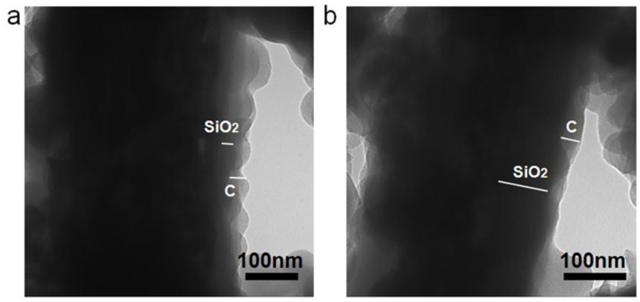


Fig. S5 (a) TEM image of $FeO_x@SiO_2@C$-20; (b) TEM image of $FeO_x@SiO_2@C$-80

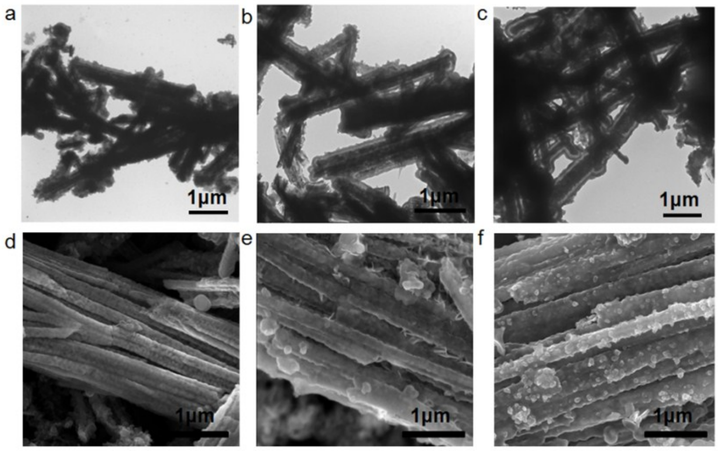


Fig. S6 (a, d) TEM image and SEM image of $FeO_x@C$-20; (b, e) TEM image and SEM image of $FeO_x@C$-40; (c, f) TEM image and SEM image of $FeO_x@C$-80.

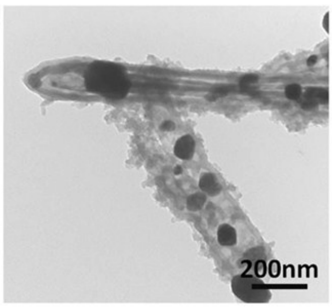
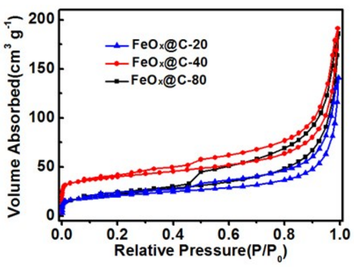


Fig. S7 TEM image of α-$Fe_2O_3@C$ nanowires without the step of silica layer coating



	FeOx@C-20	FeOx@C-40	FeOx@C-80
Surface area	60.4 m²/g	84.6m²/g	100.5m²/g
Pore size	13.9nm	12.6nm	11.5nm

Fig. S8 N_2 adsorption-desorption isotherms profile of $FeO_x@C$ yolk-shell nanowires

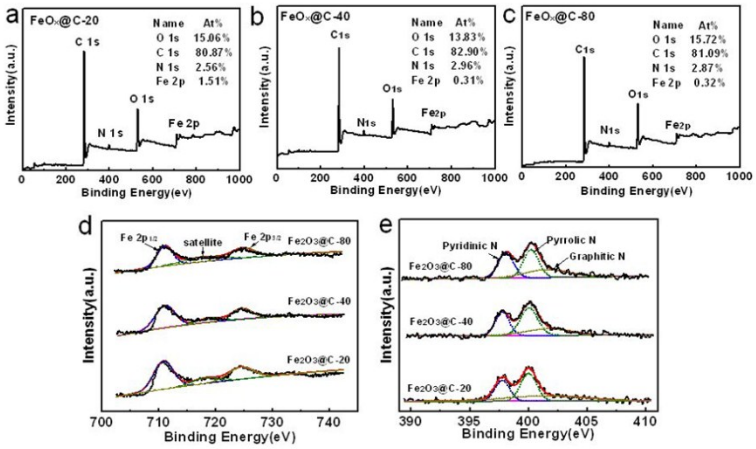


Fig. S9 (a) The XPS spectra of FeO_x@C-20; (b) The XPS spectra of FeO_x@C-40; (c) The XPS spectra of FeO_x@C-80; (d) The high resolution of Fe 2p for these three FeO_x@C yolk-shell structures; (e) The high resolution of N 1s for these three FeO_x@C yolk-shell structures

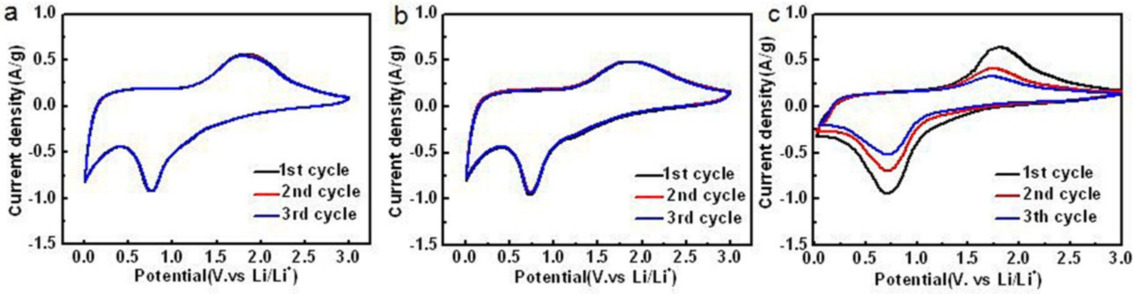


Fig. S10 (a) CV curves of FeO_x@C-20 yolk-shell nanowires at a scan rate of 0.5mV/s in the potential range from 0V to 3.0V vs. Li/Li^+; (b) CV curves of FeO_x@C-80 yolk-shell nanowires at a scan rate of 0.5mV/s in the potential range from 0V to 3.0V vs. Li/Li^+; (c) CV curves of bare α-Fe_2O_3 nanowires at a scan rate of 0.5mV/s in the potential range from 0V to 3.0V vs. Li/Li^+

Tab. S1 The volume of FeO_x, void space and the lithiated FeO_x in three samples

Parameters	FeO_x@C-20	FeOx@C-40	FeOx@C-80
R_{FeOx} (nm)	75	75	75
$R_{(FeOx+void)}$ (nm)	93	107	149
L (nm)	L	L	L
V_{FeOx} (nm^3)	17671 × L	17671 × L	17671 × L
$V_{(FeOx+void)}$	27171 × L	35968 × L	69746 × L
V_{void}	9500 × L	18297 × L	52075 × L
r (V_{void}/V_{FeOx})	0.54	1.04	2.94

The data in the table are obtained by the following formula:

$$V = \pi R^2 L,$$

$$V_{void} = V_{(FeOx+void)} - V_{FeOx},$$

V represents the volume of materials, **R** represents the radius of materials, **L** represents the length of the materials. The values of **R** in the formula are the statistical averages from the TEM images.

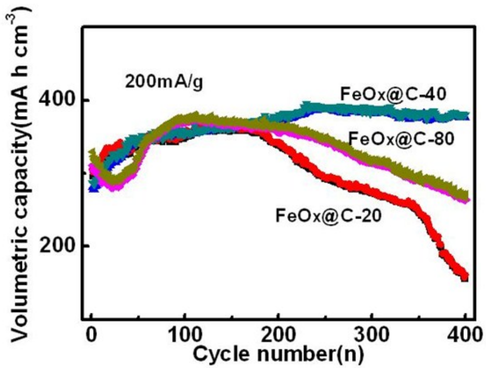


Fig. S11 The volumetric capacities versus cycle number of three FeO_x@C yolk/shell nanowires at 200mA/g for 400cycles.