Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Electronic Supplementary Information

Facile Synthesis of Co_3O_4 Nanosheets from MOFs Nanoplates for High Performance Anode of Lithium-Ion Batteries

AngLi[a,c], Ming Zhong[a,c], Wei Shuang[a,c], ChaopengWang[a,c], Jian Liu[a], Ze Chang[a,c], Xian-He Bu[a,b,c*]*

[a]School of Materials Science and Engineering, National Institute for Advanced Materials, Tianjin Key Laboratory of Metal and Molecule-Based Material Chemistry, Nankai University, Tianjin 300350, China.

[b]Key Laboratory of Advanced Energy Materials Chemistry (MOE), College of Chemistry, Nankai University, Tianjin 300071, China.

[c]Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin 300071, China.

Contacts:

Chang Ze: changze@nankai.edu.cn, Xian-He Bu: buxh@nankai.edu.cn

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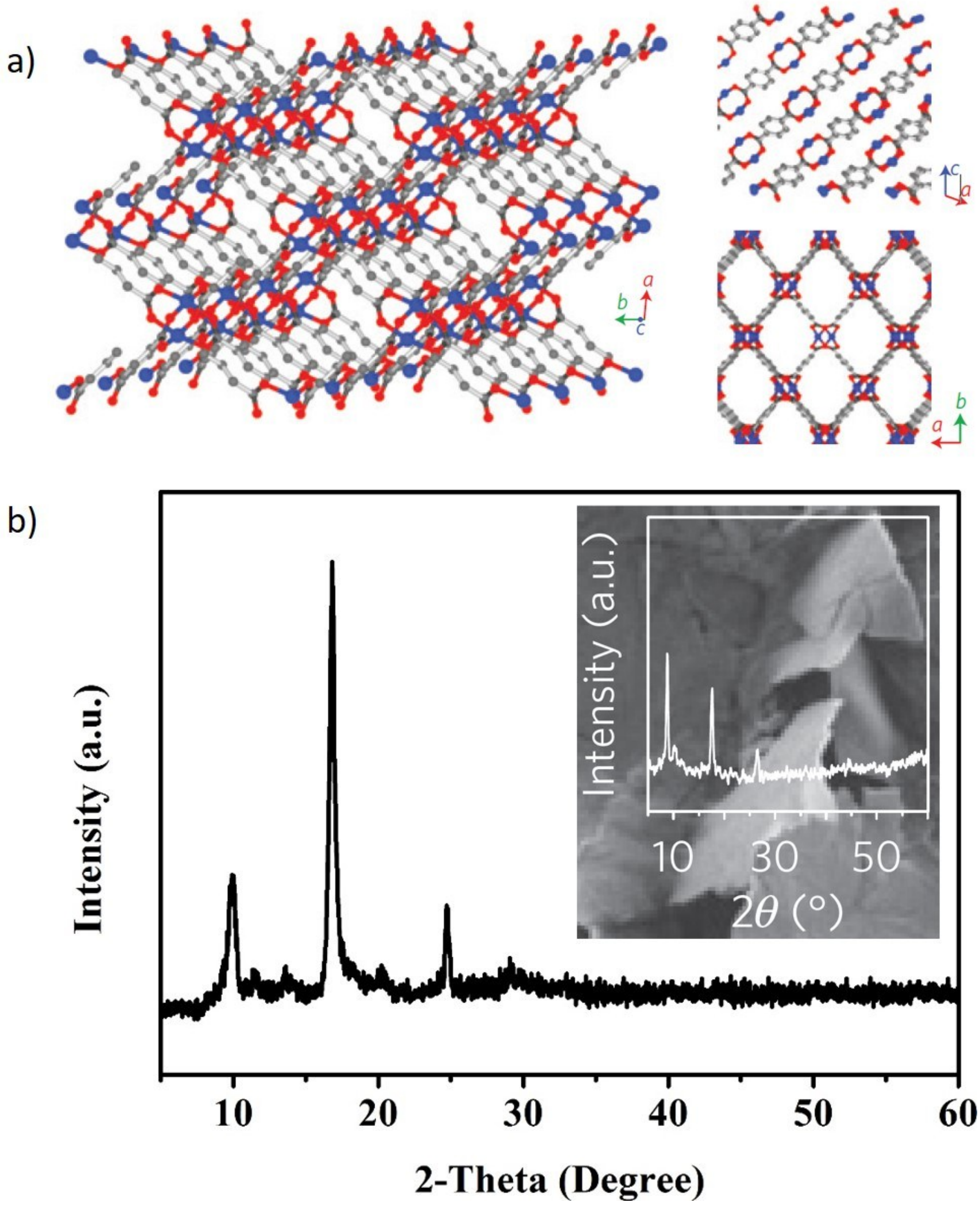


Fig. S1 Structure illustration of CoBDC (a) and PXRD pattern of the as synthesized 2D CoBDC nanoplates (b). The structure figure of isostructural CuBDC and PXRD pattern of CoBDC (inset of b) are reproduced from the original reference with permission (T. Rodenas, I. Luz, G. Prieto, B. Seoane, H. Miro, A. Corma, F. Kapteijn, F. X. LlabrésiXamena and J. Gascon, *Nat. Mater.*, 2014, **14**, 48.).

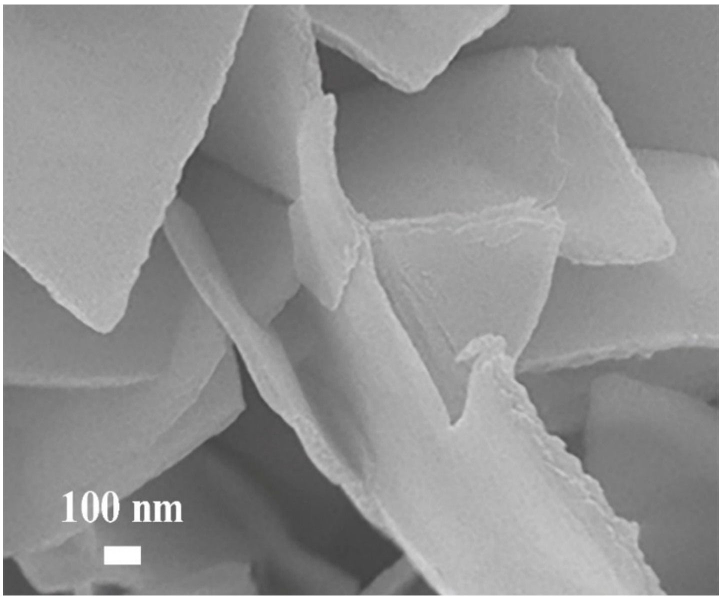


Fig. S2. SEM image of CoBDC nanoplates

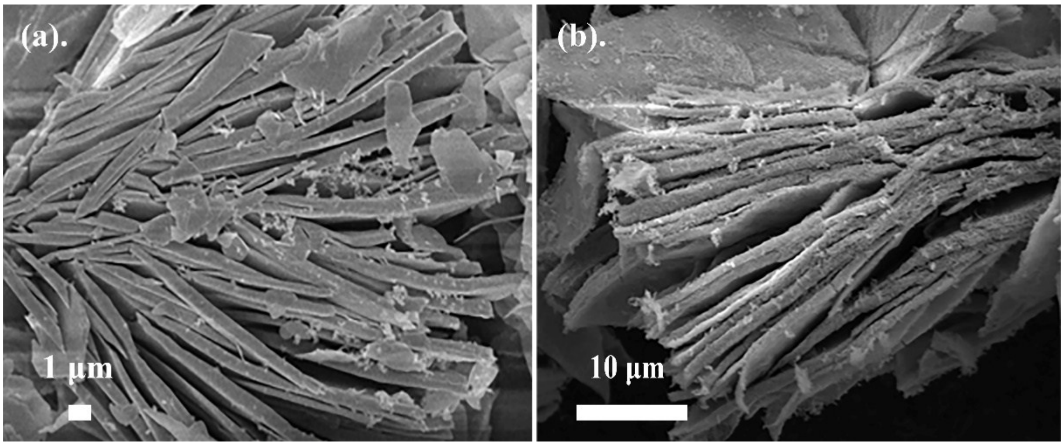


Fig. S3. SEM images of (a) bulk-type CoBDC (b) bulk-type Co_3O_4.

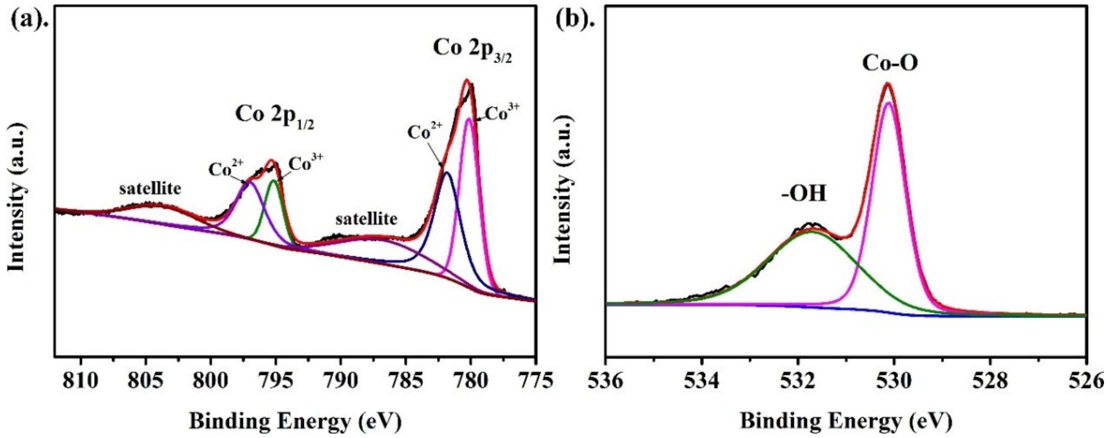


Fig. S4. XPS spectra of C_3O_4 nanosheets: (a) Co 2p; (b) O 1s.

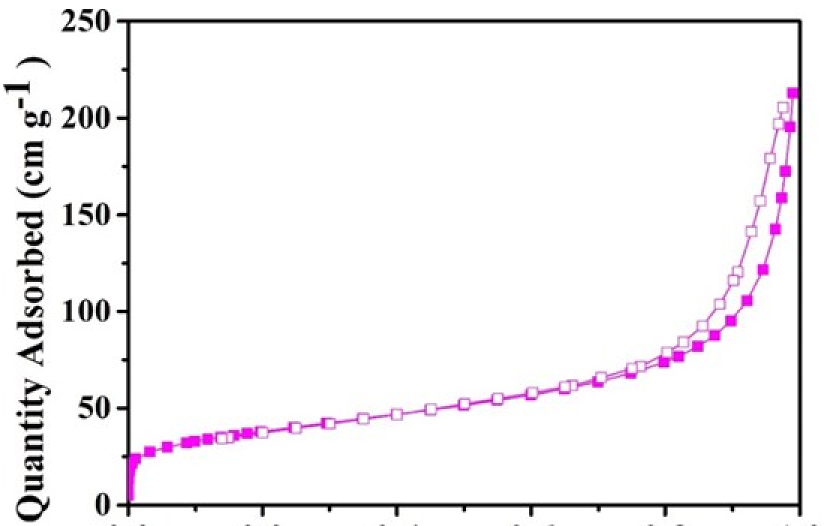


Fig. S5. Nitrogen sorption-desorption isotherms of Co_3O_4 nanosheets.

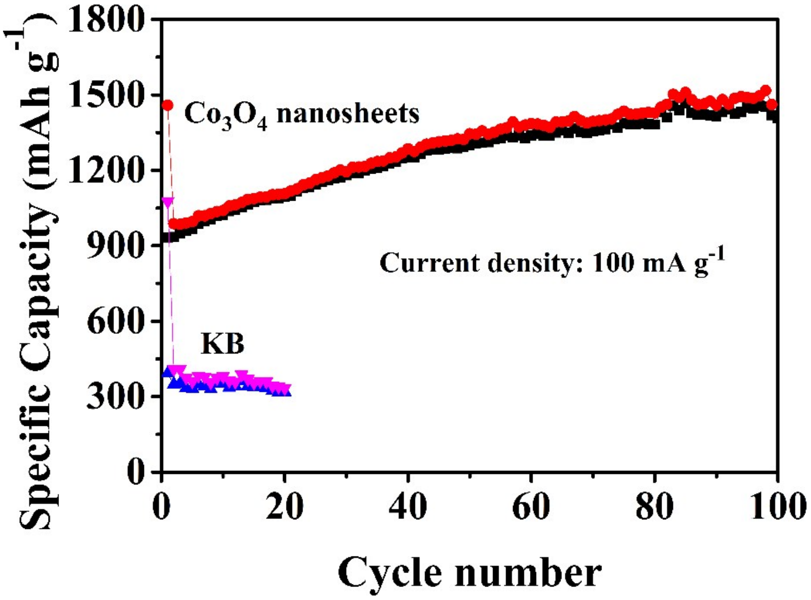


Fig. S6. The cycle performance of KB at 100 mA g^{-1}.

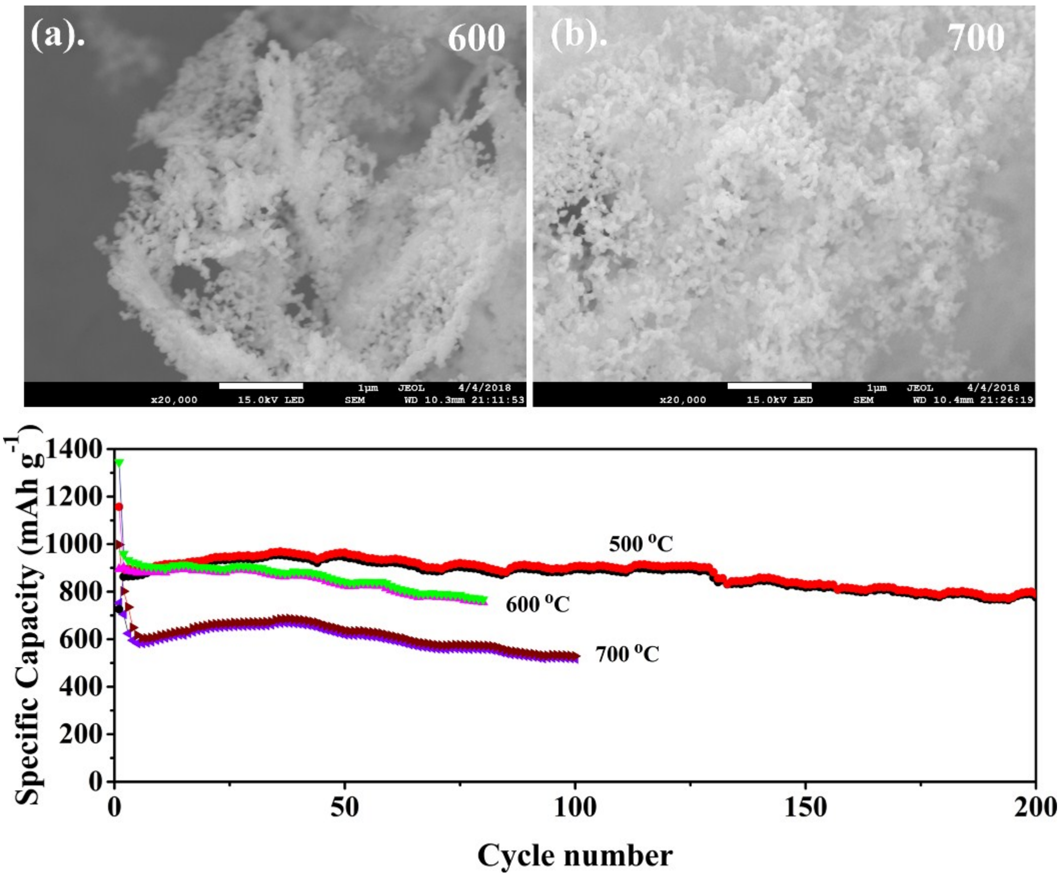


Fig. S7 (a) The SEM image of Co_3O_4 at calcination temperature of 600 ^oC. (b) The SEM image of Co_3O_4 at calcination temperature of 700 ^oC. (c) Cycling performance of Co_3O_4 electrode synthesized at different temperature at current densities of 1A·g^{-1}.

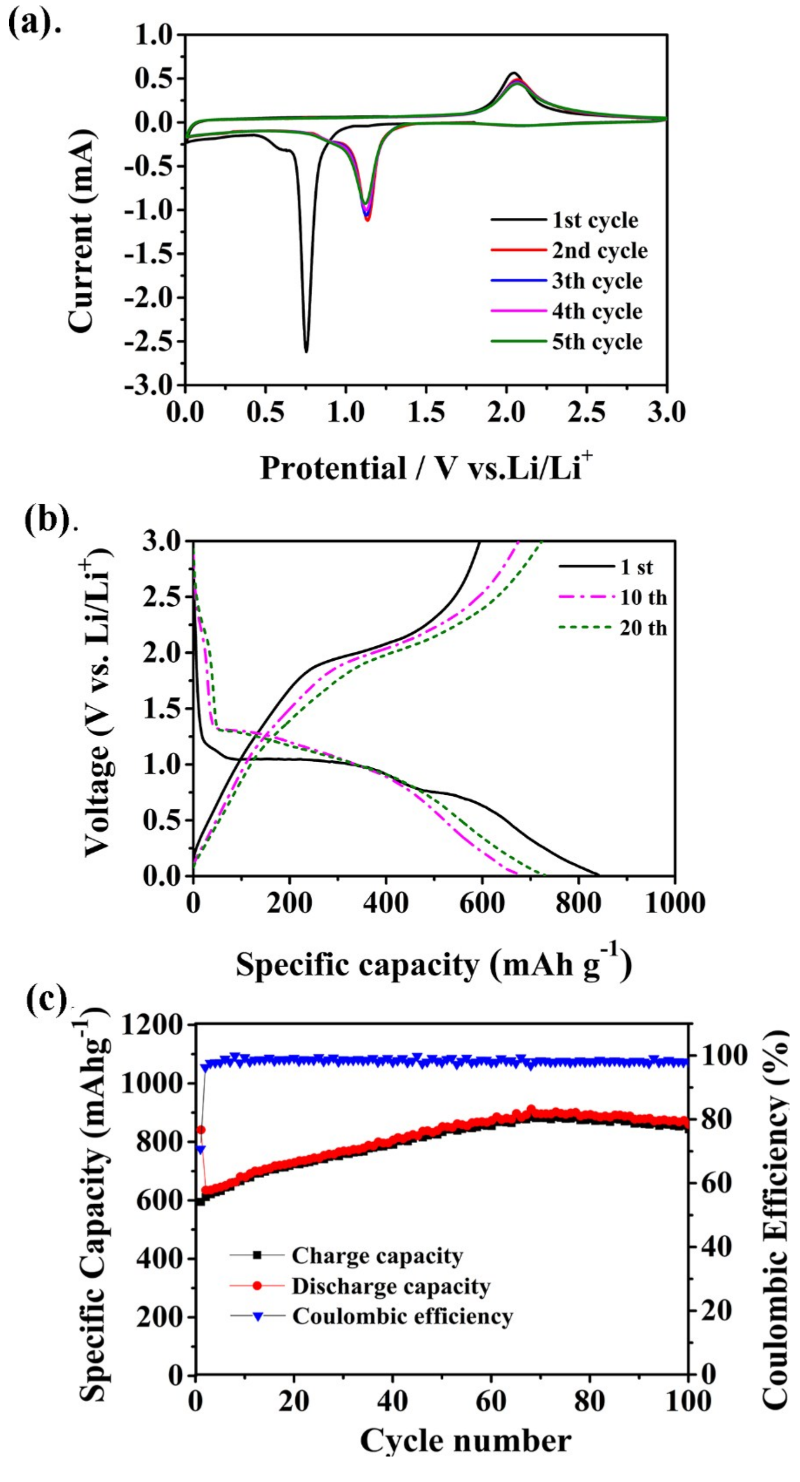


Fig. S8. (a) CV profiles of bulk-type Co_3O_4 at a scanning rate of 0.1 mV·s^{-1}. (b) Discharge−charge curves of bulk-type Co_3O_4 (c) Cycling performance of bulk-type Co_3O_4 electrode at current densities of 100 mA·g^{-1}.

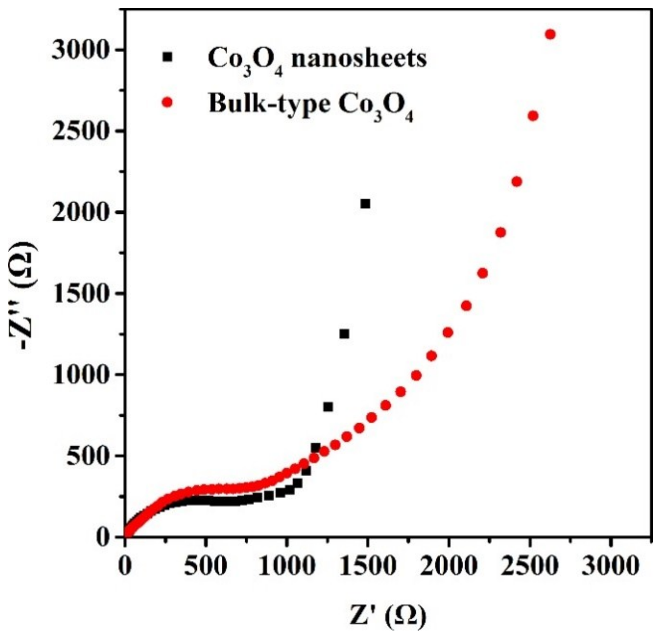
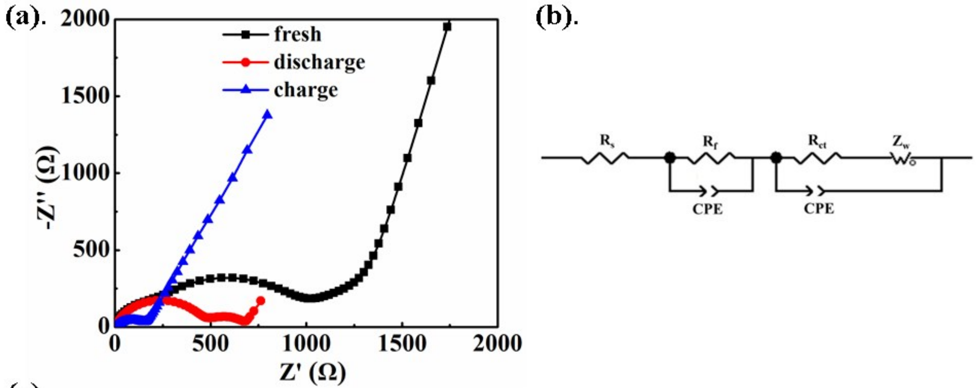


Fig. S9. Nyquist plots for Co_3O_4 nanosheets and bulk-type Co_3O_4.



(c).

Sample name	R_s/Ω	R_f/Ω	R_{ct}/Ω
fresh	2.579	209.4	713.2
discharge	2.737	454.6	248.7
charge	2.669	169.4	150.5

Fig. S10. EIS of the fresh, discharged and charged cells (a), the equivalent circuit (b), and the detailed resistance of each part (c). The measurement is performed by applying a sine wave with amplitude of 5.0 mV with frequency range of 100 kHz–0.1 Hz, and the Nyquist plots are fitted with ZView software. For the equivalent circuit, R_s denotes the electrolyte resistance, R_f represent the resistance of the SEI films, R_{ct} is the charge-transfer resistance and W_1 denotes the Warburg impedance.

Table S1. Comparison of LIBs performances of different Co_3O_4-based anodes.

Electrode materials	Cycling performance	Rate capability	References
Co_3O_4nanosheets	**1477mAh g^{-1} at 100 mA g^{-1} 775mAh g^{-1} at 1A g^{-1}**	**886 mAh g^{-1}at 2 A g^{-1} 539mAh g^{-1}at 10 A g^{-1}**	**This work**
Co_3O_4 nanostructure	1033 mAh g^{-1} at 100 mA g^{-1}	859 mAh g^{-1} at 1A g^{-1}, 758 mAhg^{-1} at 2 A g^{-1}	1
Graphene-embedded Co_3O_4 rose-spheres	1110.8 mAh g^{-1} at 90 mA g^{-1} (0.1 C)	913.8 mAh g^{-1} at 0.2 C, 462.3 mAhg^{-1} at 2 C	2
Co_3O_4hollow nanoparticles and carbon nanotubes	1281mAhg^{-1} at 0.1Ag^{-1}	715 mAh g^{-1} at 1A g^{-1}, 643 mAhg^{-1} at 2 A g^{-1}	3
Co_3O_4 nanofoils	1279.2 mAh g^{-1} at 90 mA g^{-1} (0.1 C)	Unavailable	4
MesoporousCo_3O_4nanowires	1200 mA h g^{-1} at 100 mA g^{-1}	Unavailable	5
MWCNTs/Co_3O_4nanocomposites	813 mAh g^{-1} at 100 mA g^{-1}	514 mAh g^{-1} at 1 A g^{-1}	6
Hollow Co_3O_4parallelepipeds	1115 mAh g^{-1} at 100 mA g^{-1}	738 mAh g^{-1} at 1 A g^{-1}	7
Co_3O_4 hollow dodecahedra	780 mAh g^{-1} at 100 mA g^{-1}	~600 mAh g^{-1} at 9 A g^{-1}	8

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