Supporting Information

Designed synthesis of TiO_2-modified iron oxides on/among carbon nanotubes as a superior lithium-ion storage material

Jinlong Liu,[a,b] Dong Qian,[a,b] Haibo Feng,[a] Junhua Li,[a] Jianbo Jiang,[a] Sanjun Peng,[a] and Youcai Liu*[a]*

[a] College of Chemistry and Chemical Engineering, Central South University, Changsha 410083, PR China

[b] State Key Laboratory of Powder Metallurgy, Central South University, Changsha 410083, PR China.

* Corresponding author. Telephone: +86-731-88879616. Fax: +86-731-88879616. E-mail: qiandong6@vip.sina.com (D.Q.); liuyoucai@126.com (Y.C.L.).

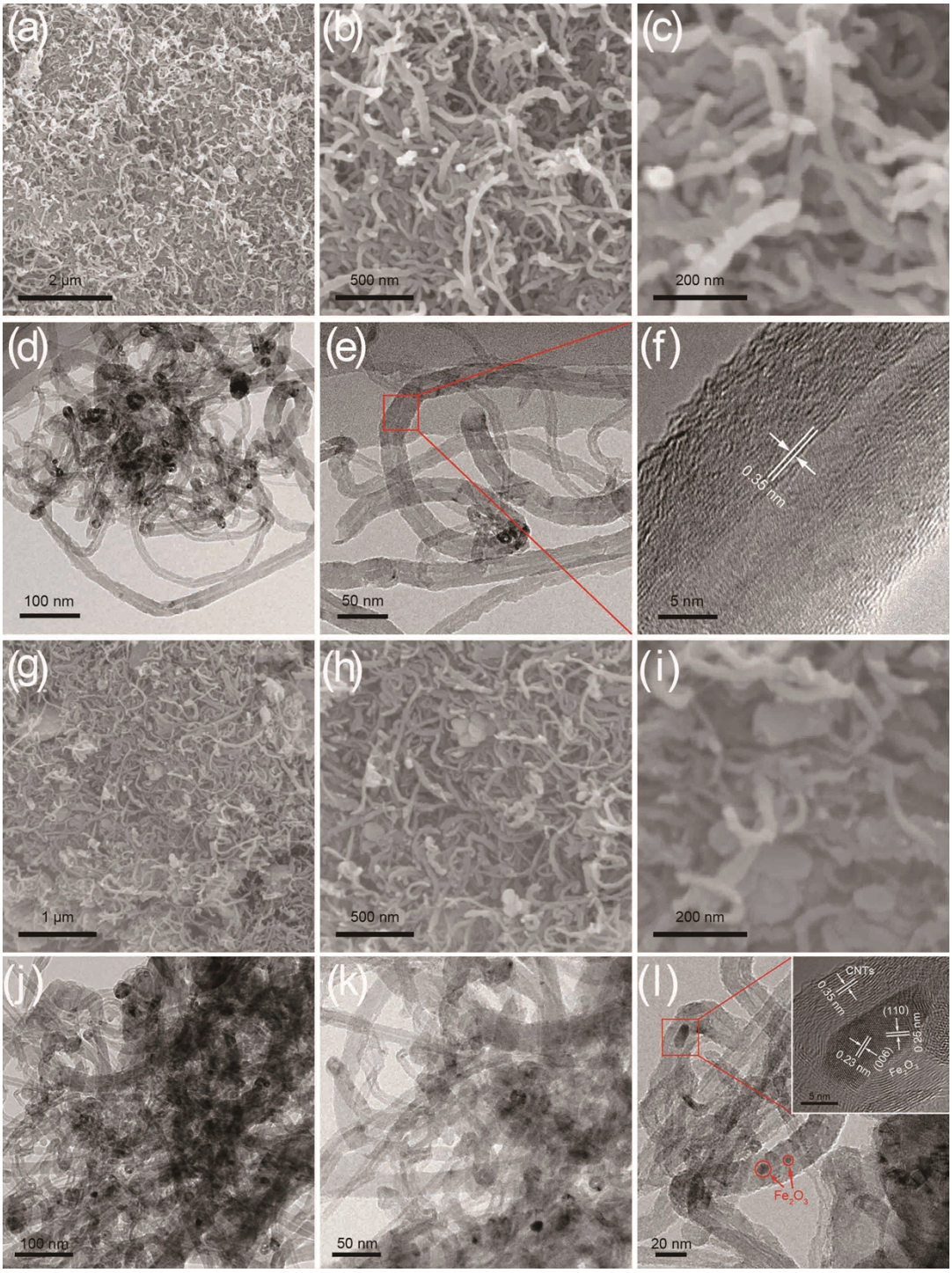

Figure S1. (a−c) SEM images, (d and e) TEM and (f) HRTEM images of acid-treated CNTs, and (g−i) SEM and (j−l) TEM images of Fe_2O_3/CNTs (the inset in (l) corresponding to the HRTEM image of selected area).

$$C_{TFCs} = C_{CNTs} \times W_{CNTs} + C_{Fe2O3} \times W_{Fe2O3} + C_{TiO2} \times W_{TiO2} \qquad (S1)$$

Equation S1. The theoretical capacity of TFCs could be calculated on the basis of the above equation. Here the theoretical capacities of CNTs, Fe_2O_3 and TiO_2 are 372, 1005 and 335 mAh g^{-1}, respectively. According to TGA and ICP analyses results, the

weight percents of CNTs, Fe_2O_3 and TiO_2 in the composite TFCs are calculated to be 15.5%, 57.3% and 27.2%, respectively. Thus, the theoretical capacity of TFCs is 724.6 mAh g^{-1}.

Table S1. Comparison of electrochemical performances of composites based on iron oxides and carbon nanotubes

Ref.	Component[a]	Carbon content (wt %)	Rate capability (mA g^{-1})	Specific capacity based on overall mass (mAh g^{-1})	Current density (mA g^{-1})	Cycle Number	Coulombic efficiency during cycling (%)	Voltage range (V)
1	C/Fe_3O_4/MWCNTs	33.3	−	656	100	145	−	0.02−3
2	Fe_2O_3/MWCNTs	1	100−1000	430	100	100	98	0.01−3
3	C/Fe_3O_4/CNTs	14	156−6250	840	390	100	~94	0.005−3
4	Fe_2O_3/CNTs	48.2	60−1200	811	35	100	−	0.02−2.5
5	Fe_2O_3/SWCNTs	12	50−2500	801	500	90	−	0.001−3
6	Fe_2O_3/CNTs	68.8	50−2000	633	50	50	−	0.005−2.5
7	Fe_2O_3/CNTs	55.2	50−500	619	50	80	−	0.01−3
8	Fe_3O_4/CNTs	~50	90−9000	836	100	100	95	0.1−3
9	C/Fe_2O_3/MWCNTs	30	500−3000	820	500	100	97−98	0.01−3
This work	TiO_2/Fe_2O_3/MWCNTs	15.5	50−10000	922	500	500	99	0.05−3
				1089	200	200	99	0.05−3

[a]C represents graphitized carbon formed by carbonization of precursor, Single-walled carbon nanotubes is denoted as SWCNTs, and Multi-walled carbon nanotubes is denoted as MWCNTs.

References

1. Y. He, L. Huang, J. S. Cai, X. M. Zheng and S. G. Sun, *Electrochim. Acta*, 2010, **55**, 1140−1144.
2. Y. Huang, Z. Dong, D. Jia, Z. Guo and W. I. Cho, *Solid State Ionics*, 2011, **201**, 54−59.
3. X. Jia, Z. Chen, X. Cui, Y. Peng, X. Wang, G. Wang, F. Wei and Y. Lu, *ACS Nano*, 2012, **6**, 9911−9919.
4. W. J. Yu, P. X. Hou, F. Li and C. Liu, *J. Mater. Chem.*, 2012, **22**, 13756−13763.

5. G. Zhou, D. W. Wang, P. X. Hou, W. Li, N. Li, C. Liu, F. Li and H. M. Cheng, *J. Mater. Chem.*, 2012, **22**, 17942−17946.
6. J. Ma, F. Yu, Z. Wen, M. Yang, H. Zhou, C. Li, L. Jin, L. Zhou, L. Chen, Z. Yuan and J. Chen, *Dalton Trans.*, 2013, **42**, 1356−1359.
7. Y. Sun, J. Zhang, T. Huang, Z. Liu and A. Yu, *Int. J. Electrochem. Sci.*, 2013, **8**, 2918−2931.
8. Y. Wu, Y. Wei, J. Wang, K. Jiang and S. Fan, *Nano Lett.*, 2013, **13**, 818−823.
9. Z. Wang, D. Luan, S. Madhavi, Y. Hu and X. W. Lou, *Energy Environ. Sci.*, 2012, **5**, 5252−5256.