Supporting information

Self-Volatilization Approach to Mesoporous Carbon Nanotubes/Silver Nanoparticles Hybrids: the Role of Silver in Boosting Li-Ion Storage

Hao Jiang,[†] *Haoxuan Zhang,*[†] *Yao Fu,*[†] *Shaojun Guo,*[‡,]* *Yanjie Hu,*[†] *Ling Zhang,*[†] *Yu Liu,*[§,]* *Honglai Liu,*[§] *Chunzhong Li*[†,]*

[†] Key Laboratory for Ultrafine Materials of Ministry of Education, School of Materials Science and Engineering, East China University of Science and Technology, Shanghai 200237, China

[‡] Department of Materials Science and Engineering, & Department of Energy and Resources Engineering, College of Engineering, Peking University, Beijing, 100871, China.

[§] State Key Laboratory of Chemical Engineering and Department of Chemical Engineering, East China University of Science and Technology, Shanghai 200237, China

*Corresponding author: Tel.: +86-21-64250949, Fax: +86-21-64250624

E-mail: czli@ecust.edu.cn (Prof. C. Z. Li), liuyu@ecust.edu.cn (Dr. Y. Liu) and guosj@pku.edu.cn (Prof. S. J. Guo)

1. Figures

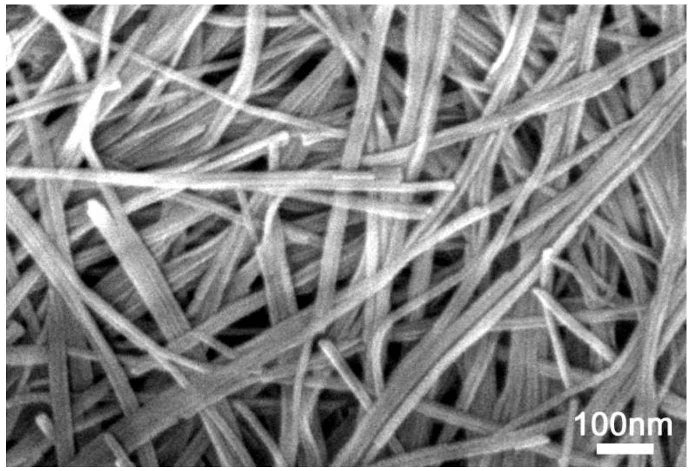


Figure S1. SEM image of the silver vanadium oxide (Ag-V2O5) NWs.

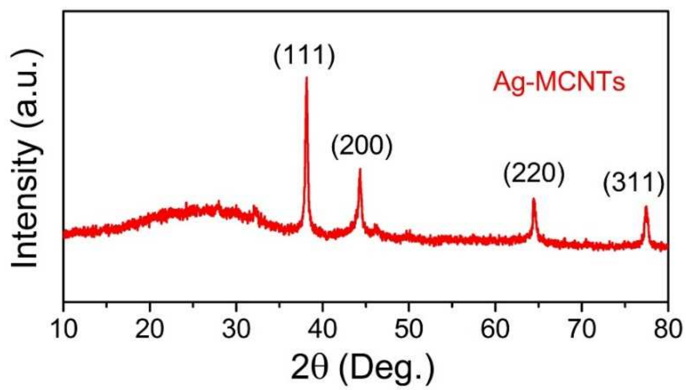


Figure S2. XRD pattern of the Ag-MCNTs

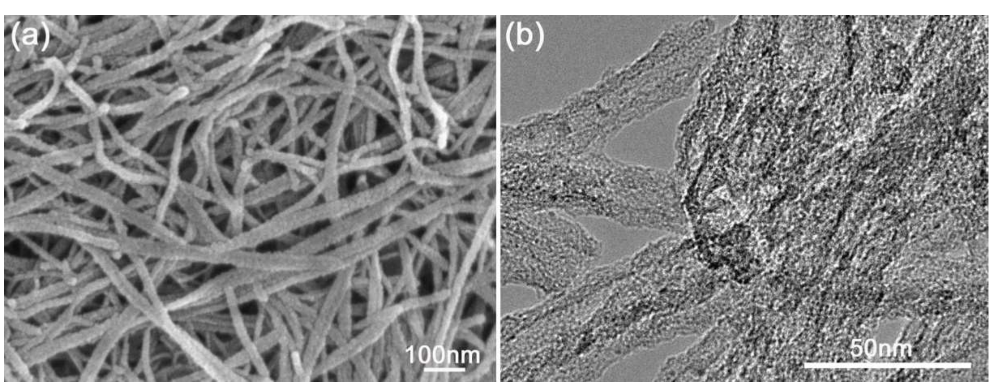


Figure S3. (a) SEM and (b) TEM images of MCNTs.

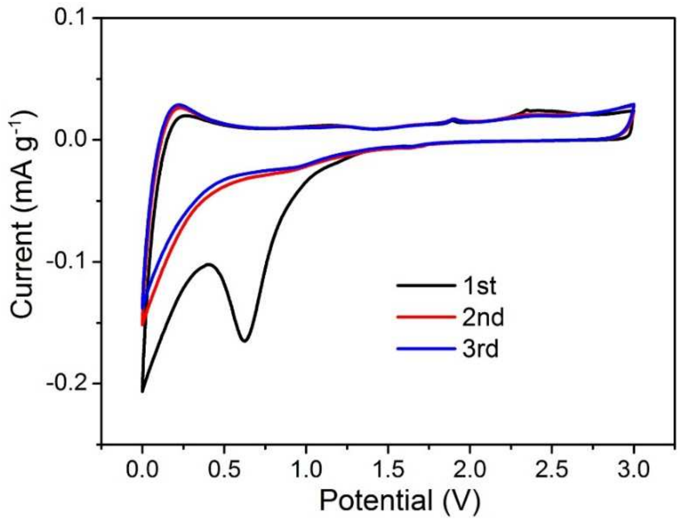


Figure S4. CV curves of the commercial CNTs.

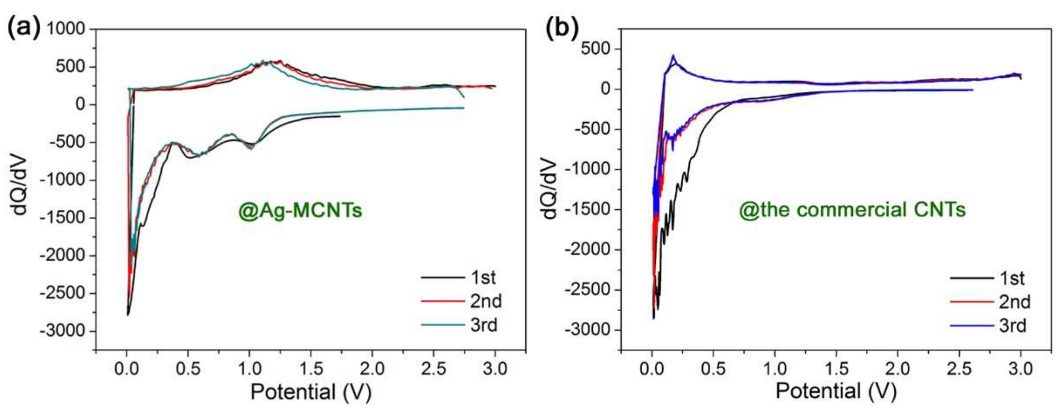


Figure S5. The differential capacity plots of (a) the Ag-MCNTs and (b) the commercial CNTs for the first three cycles at a scan rate of 0.2 mV s^{-1}.

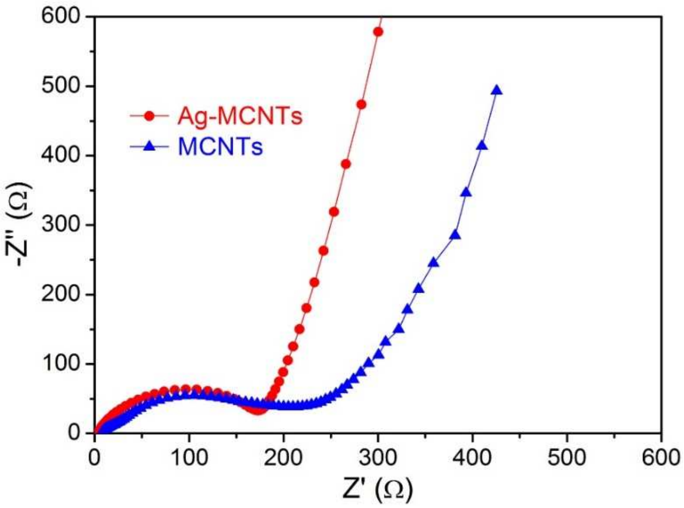


Figure S6. Electrochemical impedance spectra of Ag-CNTs and MCNTs.

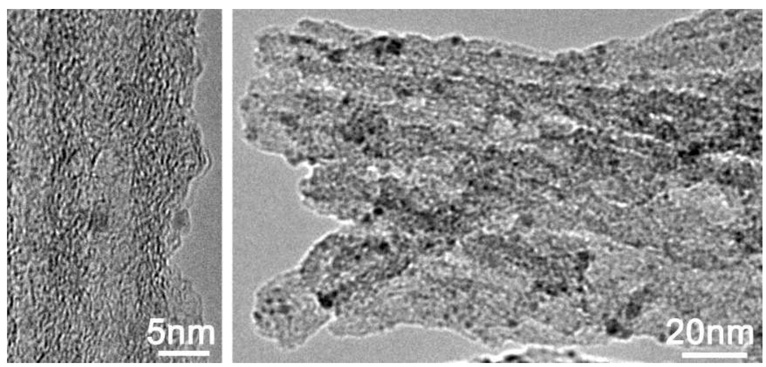


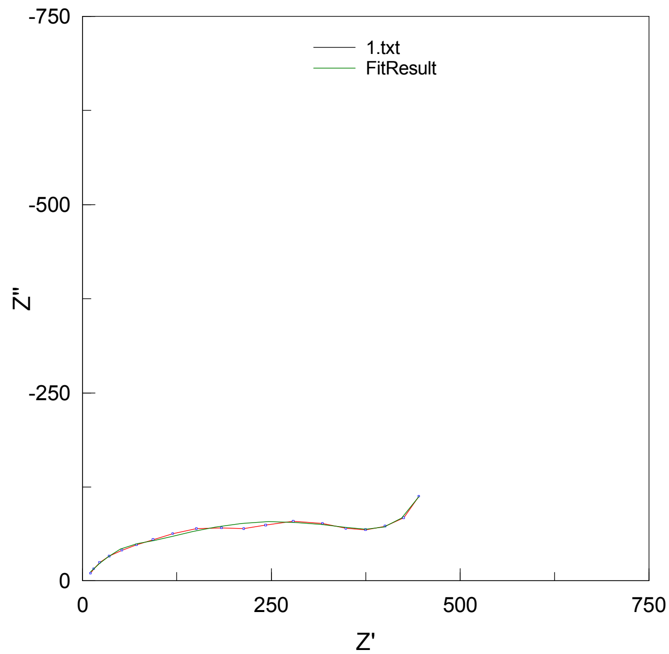
Figure S7. High-resolution and high-magnification TEM images of Ag-MCNTs.

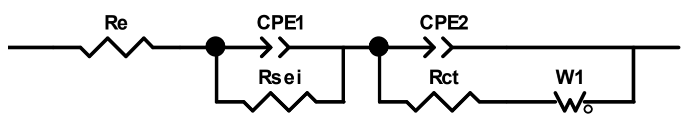
2. Tables

Table S1 The comparisons of the electrochemical performance of various carbon anodes.

Samples	Current density (mA g^{-1})	Reversible capacity (mAh g^{-1})	Cycle number (Times)	Capacity retention (%)	Reference
Mesoporous nitrogen-rich carbons	500	630	100	70	S1
Nitrogen-doped multiwall carbon nanotubes	1200	700	200	93	S2
High concentration nitrogen doped carbon nanotubes	100	397	100	80	S3
Rod-shaped ordered mesoporous carbon	100	1012	100	86.6	S4
Hollow carbon-nanotube/nanofiber hybrids	100	1150	70	77	S5
Hierarchical porous carbon nanosheets	20	625	50	85	S6
Amorphous carbon nanotubes decorated with hollow graphitic carbon nanospheres	50	969	100	99	S7
Nanographene-based hollow carbon spheres	75	713	-	-	S8
Carbon nanorings	400	1263	100	98	S9
Ag-MCNTs	**100**	**1637**	**>500**	**87.4**	**This work**

Table S2 The fitting of impedance spectra to the proposed equivalent circuit by the code Zview for Ag-MCNTs.





Element	Freedom	Value	Error	Error %
Re	Fixed(X)	-5	N/A	N/A
CPE1-T	Free(+)	9.0148E-06	9.315E-06	103.33
CPE1-P	Free(+)	0.99148	0.1368	13.798
Rsei	Free(+)	25.07	9.5925	38.263
CPE2-T	Free(+)	0.00041662	7.0097E-05	16.825
CPE2-P	Free(+)	0.41498	0.012423	2.9936
Rct	Free(+)	458.7	24.026	5.2378
W1-R	Free(+)	768.4	1539.8	200.39
W1-T	Free(+)	26.71	58.162	217.75
W1-P	Free(+)	0.78103	0.16742	21.436

Chi-Squared:	0.003671
Weighted Sum of Squares:	0.10646

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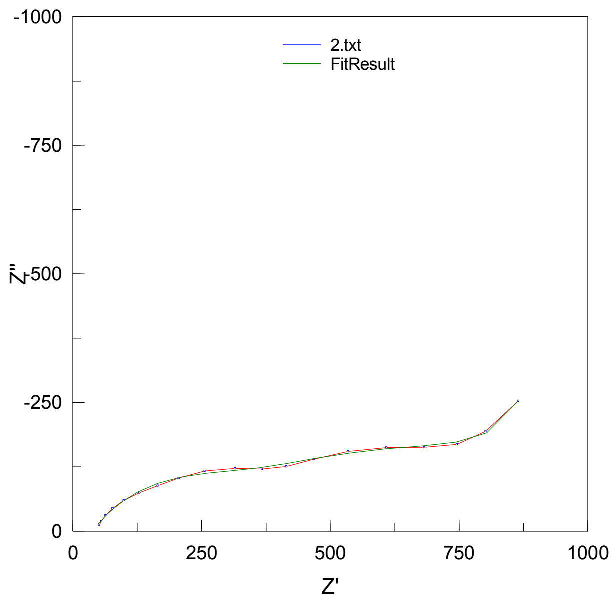
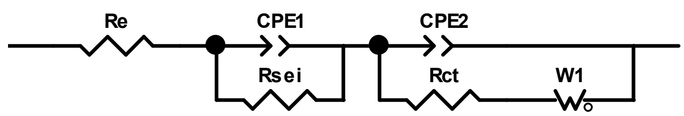
Circuit Model File:	D:\软 件 \ZVIEW\ZModels\1.mdl
Mode:	Run Fitting / Freq. Range (0.001 - 1000000)
Maximum Iterations:	100
Optimization Iterations:	0
Type of Fitting:	Complex
Type of Weighting:	Calc-Modulus

Table S3 The fitting of impedance spectra to the proposed equivalent circuit by the code Zview for MCNTs.



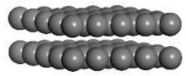
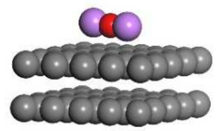
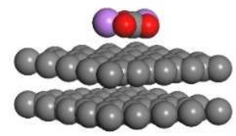
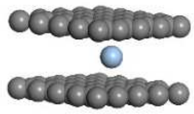
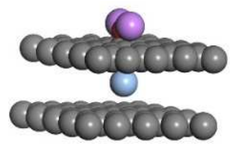
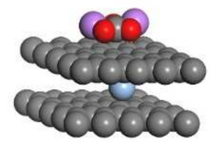


Element	Freedom	Value	Error	Error %
Re	Fixed(X)	37.08	N/A	N/A
CPE1-T	Free(+)	4.9793E-05	1.0052E-05	20.188
CPE1-P	Free(+)	0.65811	0.037736	5.734
Rsei	Free(+)	213.2	37.228	17.462
CPE2-T	Free(+)	0.00062699	8.609E-05	13.731
CPE2-P	Free(+)	0.44157	0.018088	4.0963
Rct	Free(+)	841.3	55.935	6.6486
W1-R	Free(+)	2055	362.48	17.639
W1-T	Free(+)	24.08	3.9634	16.459
W1-P	Free(+)	0.90371	0.057368	6.3481

Chi-Squared:	0.00085848
Weighted Sum of Squares:	0.024896

Data File:	C:\Users\Administrator\Desktop\2.txt
Circuit Model File:	D:\软 件 \ZVIEW\ZModels\1.mdl
Mode:	Run Fitting / Freq. Range (0.001 - 1000000)
Maximum Iterations:	100
Optimization Iterations:	0
Type of Fitting:	Complex
Type of Weighting:	Calc-Modulus

Table S4 The binding energy of the other two component Li_2O and Li_2CO_3

	Vacuum	**Li_2O**	**Li_2CO_3**
Graphite		 ΔE = -8.1 kcal/mol	 ΔE = -12.1 kcal/mol
Ag-Graphite		 ΔE = 42.18 kcal/mol	 ΔE = 57.53 kcal/mol

3. References

S1 Li, Z.; Xu, Z.; Tan, X.; Wang, H.; Holt, C. M. B.; Stephenson, T.; Olsen, B. C.; Mitlin, D. Mesoporous Nitrogen-rich Carbons Derived from Protein for Ultra-high Capacity Battery Anodes and Supercapacitors. *Energy Environ. Sci.* **2013**, *6*, 871-878.

S2 Shin, W. H.; Jeong, H. M.; Kim, B. G.; Kang, J. K.; Choi, J. W. Nitrogen-Doped Multiwall Carbon Nanotubes for Lithium Storage with Extremely High Capacity. *Nano Lett.* **2012**, *12*, 2283-2288.

S3 Li, X.; Liu, J.; Zhang, Y.; Li, Y.; Liu, H.; Meng, X.; Yang, J.; Geng, D.; Wang, D.; Li, R.; Sun, X. High concentration nitrogen doped carbon nanotube anodes with superior Li^+ storage performance for lithium rechargeable battery application. *J. Power Sources* **2012**, *197*, 238-245.

S4 Kim, M. S.; Bhattacharjya, D.; Fang, B.; Yang, D. S.; Bae, T. S.; Yu, J. S. Morphology-Dependent Li Storage Performance of Ordered Mesoporous Carbon as Anode Material. *Langmuir* **2013**, *29*, 6754-6761.

S5 Chen, Y. M.; Li, X. Y.; Park, K.; Song, J.; Hong, J. H.; Zhou, L. M.; Mai, Y. W.; Huang, H. T.; Goodenough, J. B. Hollow Carbon-Nanotube/Carbon-Nanofiber Hybrid Anodes for Li-Ion Batteries. *J. Am. Chem. Soc.* **2013**, *135*, 16280-16283.

S6 Yang, S.; Feng, X.; Zhi, L.; Cao, Q.; Maier, J.; Muellen, K. Nanographene-Constructed Hollow Carbon Spheres and Their Favorable Electroactivity with Respect to Lithium Storage. *Adv. Mater.* **2010**, *22*, 838-842.

S7 Chen, Y.; Lu, Z.; Zhou, L.; Mai, Y.-W.; Huang, H. Triple-Coaxial Electrospun Amorphous Carbon Nanotubes with Hollow Graphitic Carbon Nanospheres for High- Performance Li Ion Batteries. *Energy Environ. Sci.* **2012**, *5*, 7898-7902.

S8 Song, R. R.; Song, H. H.; Zhou, J. S.; Chen, X. H.; Wu, B.; Yang, H. Y. Hierarchical Porous Carbon Nanosheets and Their Favorable High-Rate Performance in Lithium Ion Batteries. *J. Mater. Chem.* **2012**, *22*, 12369-12374.

S9 Sun, J.; Liu, H.; Chen, X.; Evans, D. G.; Yang, W.; Duan, X. Carbon Nanorings and Their Enhanced Lithium Storage Properties. *Adv. Mater.* **2013**, *25*, 1125-1130.