Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Encapsulating silicon nanoparticles into mesoporous carbon forming pomegranate-structure microspheres as high-performance anode for lithium ion batteries

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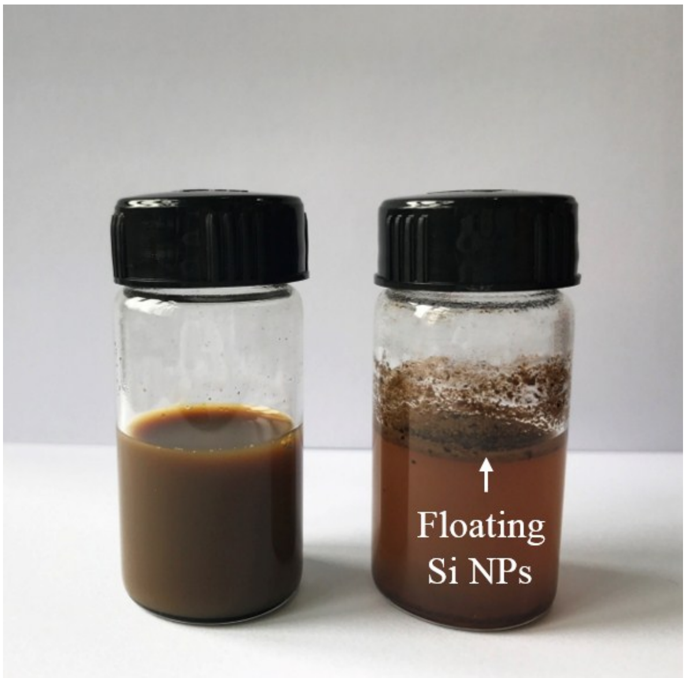

Figure S1. Dispensability of Si NPs in water with and without adding F-127. The Si NPs are totally separated in the water and form a homogeneous suspension (a), while there are a large amount of Si NPs still floating over the water after sonicate (b).

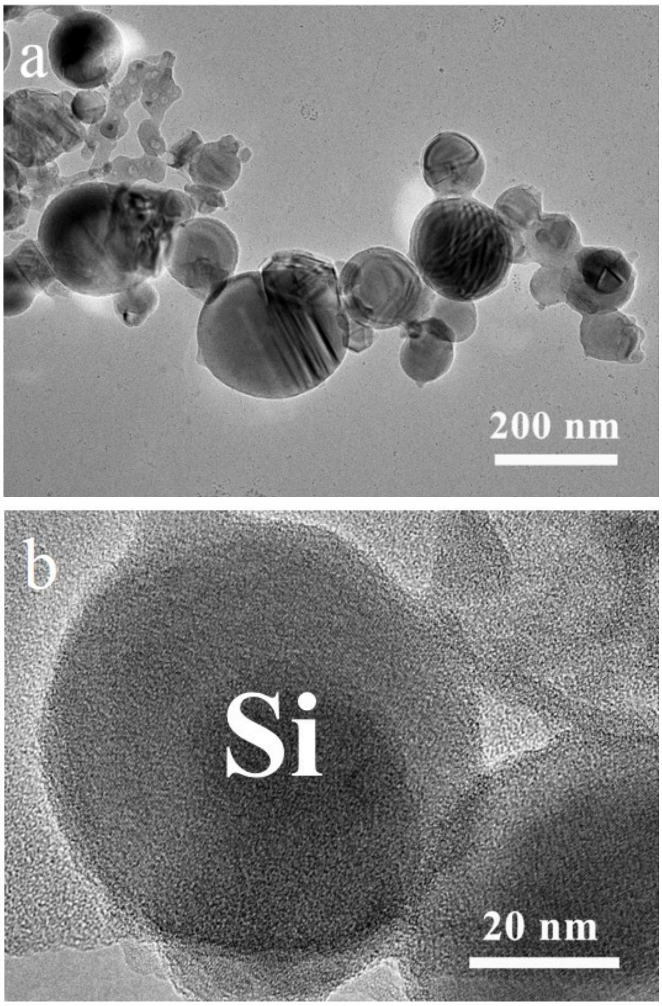

Figure S2. TEM images of Si NPs (a) and single Si nanoparticle.

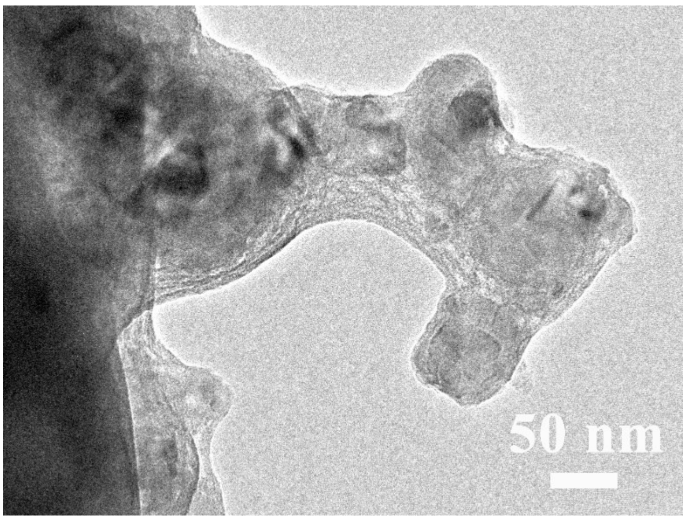

Figure S3. Magnified TEM image of MP-Si/C.

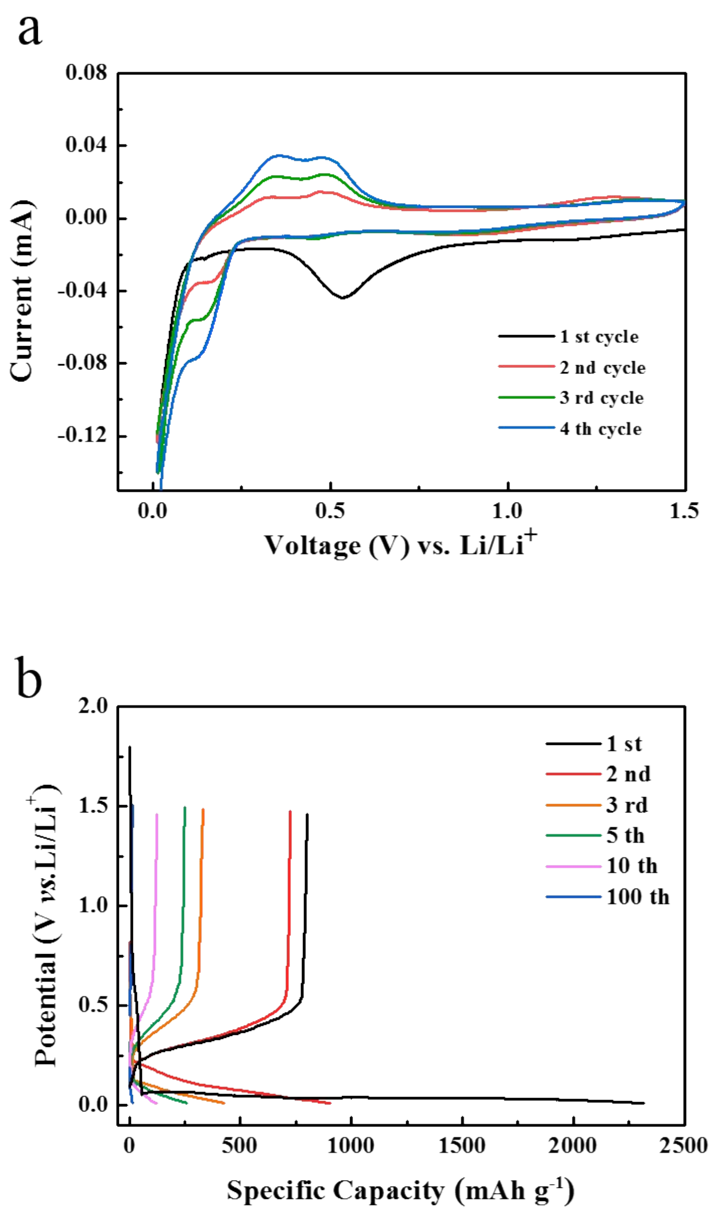

Figure S4. Electrochemical characterizations of Si NPs: (a) CV curves at a scan rate of 0.1 mV s^{-1} between 0.01 and 1.5 V versus Li/Li^{+}. (b) Charge/discharge voltage profiles of 1st, 2nd, 3rd, 5th, 10th and 100th cycle at 0.2 A g^{-1}.

Table S1. Comparison of the electrochemical performance of silicon/carbon composite anodes.

Sample	Initial coulombic efficiency (%)	Current density (A g^{-1})	Cycle number	Stable capacity after n-cycles (mAh g^{-1})	Capacity retention	Ref.
Porous Si/rGO	48.5%	0.05	100	1004	65.3%	1
Si/C NBs	80%	0.05	50	1020	84.3%	2
Si NPs/IOC (40%)	79%	0.1	50	1233	81%	3
C-PDA–Si NFs	80% (0.05 A g^{-1})	0.1	50	1601	65.3%	4
Si/rGO films	53%	0.2	150	660	62.7%	5
Watermelon-inspired Si/C	89.2% (0.06 A g^{-1})	0.3	500	465.8	75.2%	6
Si@PCM	65.55%	0.5	100	1249	64.8%	7
CuO@Si NWAs	36%	0.84	50	1381	57%	8
rGO-porous Si	68.8% (0.05 A g^{-1})	1	200	830	49%	9
Si@C/GF	61.5% (0.1 A g^{-1})	1	200	~650	85.1%	10
MP-Si/C	51.8%	0.2	100	581	77.4%	Our work

References

1. H. Tang, J. Zhang, Y. J. Zhang, Q. Q. Xiong, Y. Y. Tong, Y. Li, X. L. Wang, C. D. Gu and J. P. Tu, *J. Power Sources*, 2015, **286**, 431-437.
2. W. Ren, Y. Wang, Q. Tan, Z. Zhong and F. Su, *J. Power Sources*, 2016, **332**, 88-95.
3. D. Gueon, D.-Y. Kang, J. S. Kim, T. Y. Kim, J. K. Lee and J. H. Moon, *J. Mater. Chem. A*, 2015, **3**, 23684-23689.
4. J. Kong, W. A. Yee, Y. Wei, L. Yang, J. M. Ang, S. L. Phua, S. Y. Wong, R. Zhou, Y. Dong, X. Li and X. Lu, *Nanoscale*, 2013, **5**, 2967-2973.
5. H. X. Zhang, S. L. Jing, Y. J. Hu, H. Jiang and C. Z. Li, *J. Power Sources*, 2016, **307**, 214-219.
6. Q. Xu, J. Y. Li, J. K. Sun, Y. X. Yin, L. J. Wan and Y. G. Guo, *Adv. Energy Mater.*, 2016, DOI: 10.1002/aenm.201601481, 1601481.
7. L. Wu, J. Yang, X. Zhou, M. Zhang, Y. Ren and Y. Nie, *J. Mater. Chem. A*, 2016, **4**, 11381-11387.
8. H. Wu, X. Xia, N. Du, Z. Li, B. Sun, Y. Chen and D. Yang, *J. Alloys Compd.*, 2016, **689**, 56-62.
9. L. S. Jiao, J. Y. Liu, H. Y. Li, T. S. Wu, F. Li, H. Y. Wang and L. Niu, *J. Power Sources*, 2016, **315**, 9-15.
10. F. Zhang, X. Yang, Y. Xie, N. Yi, Y. Huang and Y. Chen, *Carbon*, 2015, **82**, 161-167.