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Supplementary Information for

Double-Shelled Hollow Carbon Nanospheres as an Enclosed Electrochemical Reactor to Enhance the Lithium Storage Performance of Silicon Nanodots

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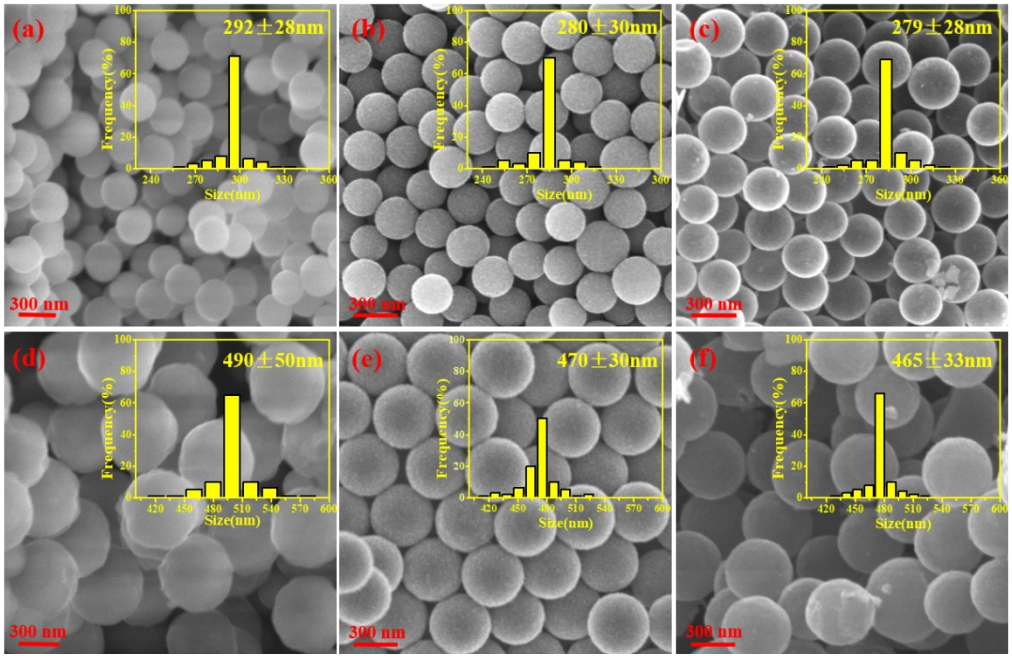


Figure S1. SEM images and particle size distributions of (a) SiO_2@SiO_2/RF, (b)SiO_2@SiO_2/C, (c) SiNDs@SSHC, (d) SiO_2@SiO_2/RF@SiO_2@SiO_2/RF, (e) SiO_2@SiO_2/C@SiO_2@SiO_2/C and (f) SiNDs@DSHC.

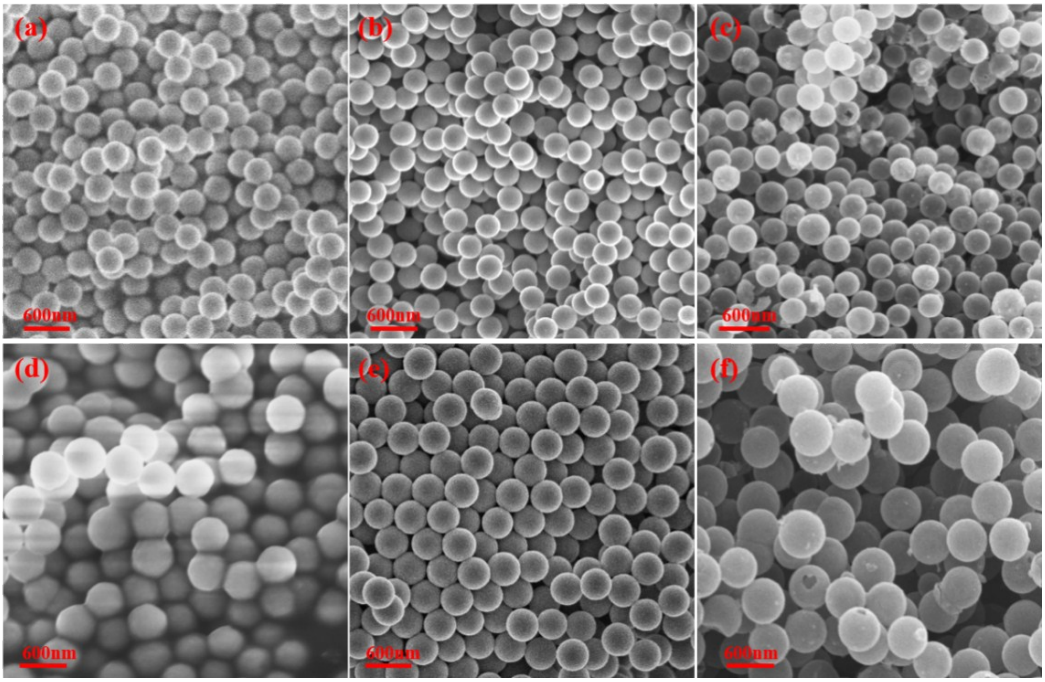
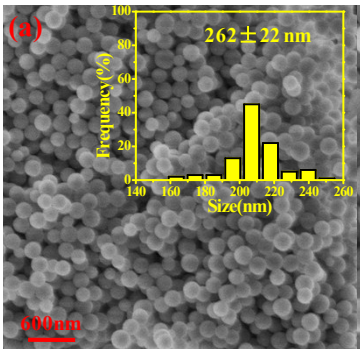
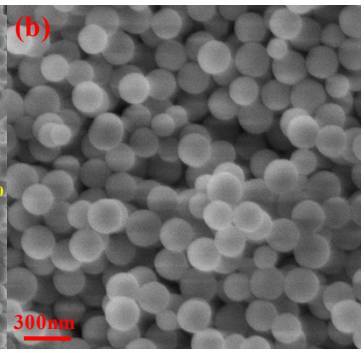


Figure S2. SEM images with low magnifications of (a) SiO_2@SiO_2/RF, (b)SiO_2@SiO_2/C, (c) SiNDs@SSHC, (d) SiO_2@SiO_2/RF@SiO_2@SiO_2/RF, (e) SiO_2@SiO_2/C@SiO_2@SiO_2/C and (f) SiNDs@DSHC.





(c) **Analysis of spectrum : Spectra from Area**

	1	2	3
C	29.52	30.59	37.80
Si	70.48	69.41	62.20

Figure S3. (a and b) SEM low and high magnification images of SiO_2 stirred for 15min. (c) The element distributions of C and Si in different regions in Figure 2(g).

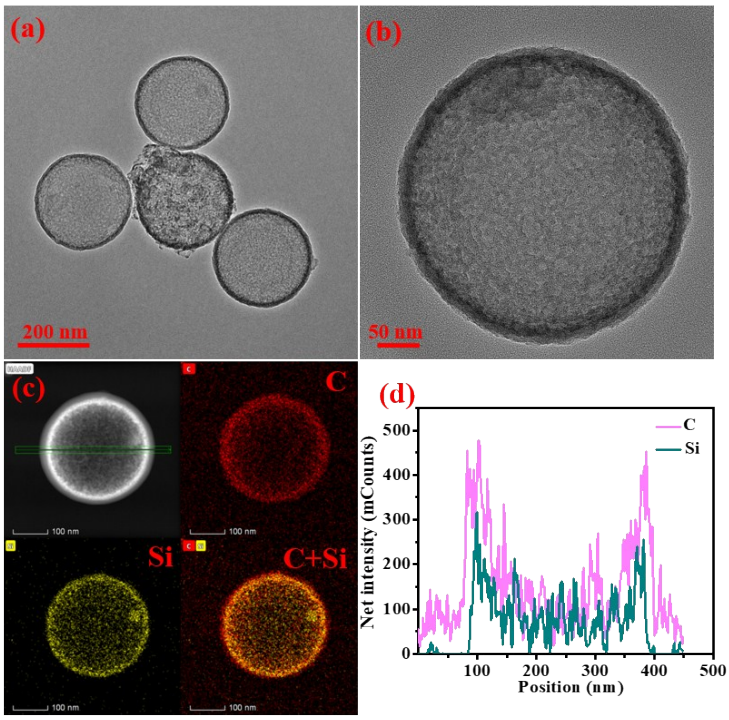


Figure S4. (a and b) TEM low and high magnification images (c) EDS elemental mapping images of carbon, silicon and overlap. (d) EDX line scan imageof SiNDs@SSHC.

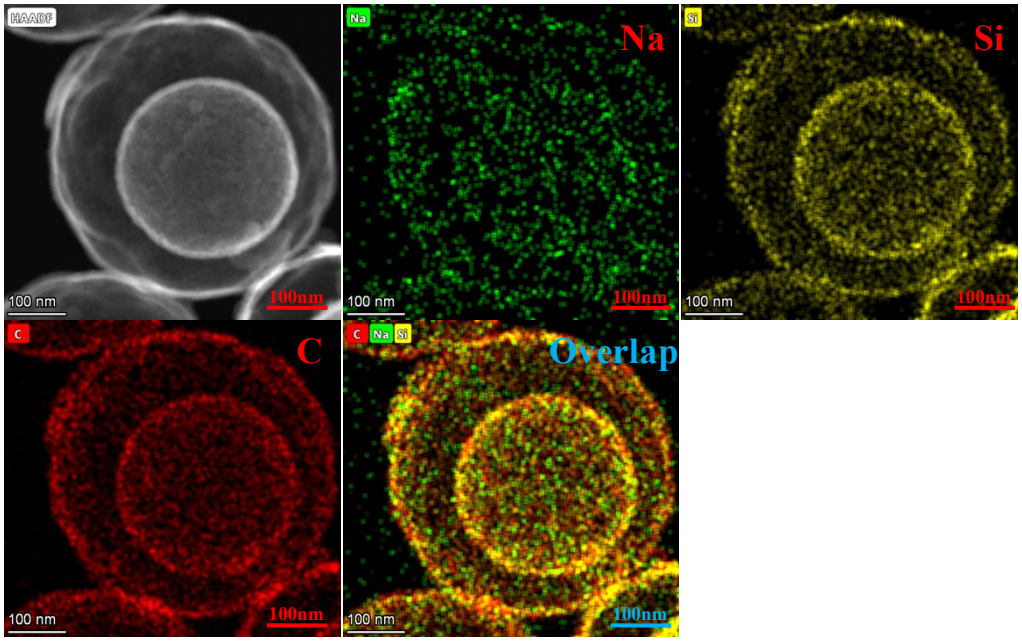


Figure S5. EDX elemental mapping images of sodium, silicon, carbon and overlap of SiNDs@DSHC soaked in $NaPF_6$ for 24 h.

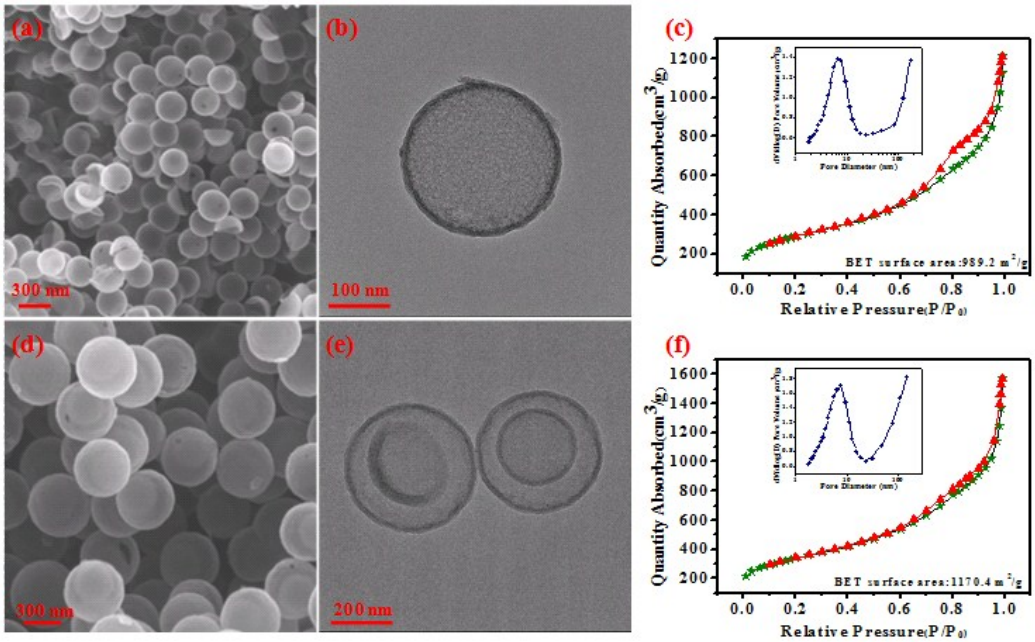


Figure S6. (a) SEM (b) TEM (c) Nitrogen adsorption/ desorption isotherm and the inset shows BJH pore size distribution of SSHC. (d) SEM (e) TEM (f) Nitrogen adsorption/ desorption isotherm and the inset shows BJH pore size distribution of DSHC.

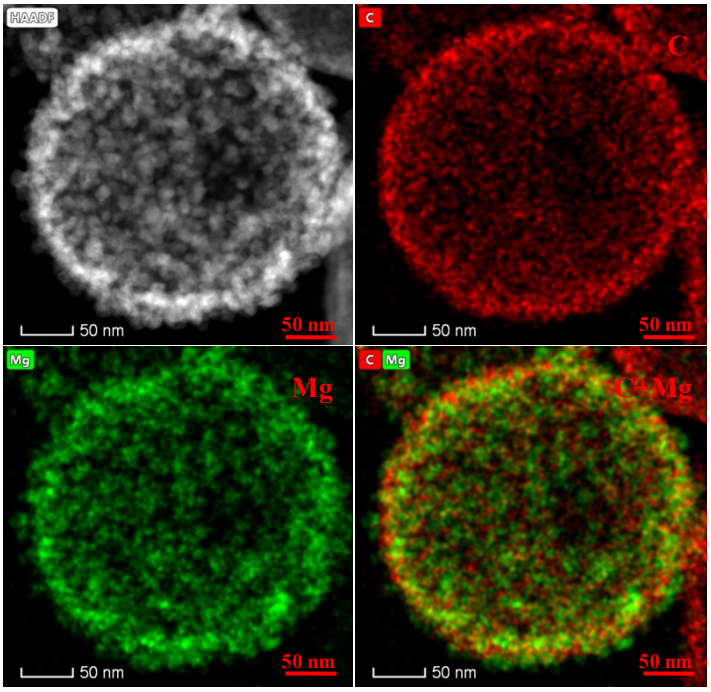


Figure S7. EDX elemental mapping images of carbon, silicon and overlap of calcining hollow carbon and Mg.

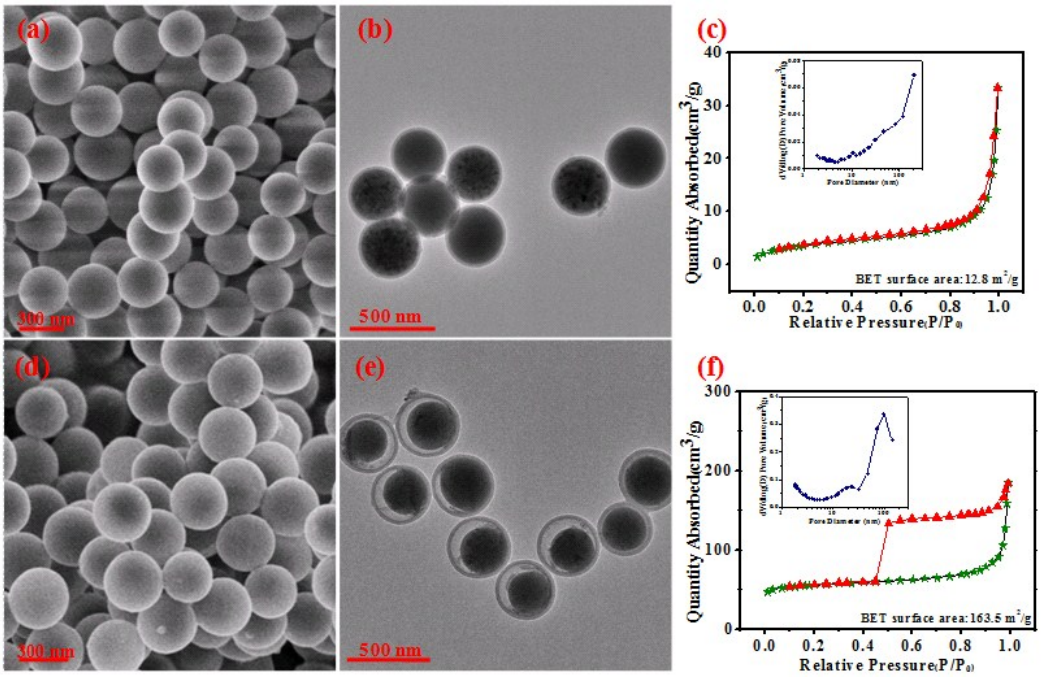


Figure S8. (a) SEM (b) TEM and (c) Nitrogen adsorption/ desorption isotherm and the inset shows BJH pore size distribution of SiO_2@C. (d) SEM (e) TEM and (f) Nitrogen adsorption/ desorption isotherm and the inset shows BJH pore size distribution of etched SiO_2@C.

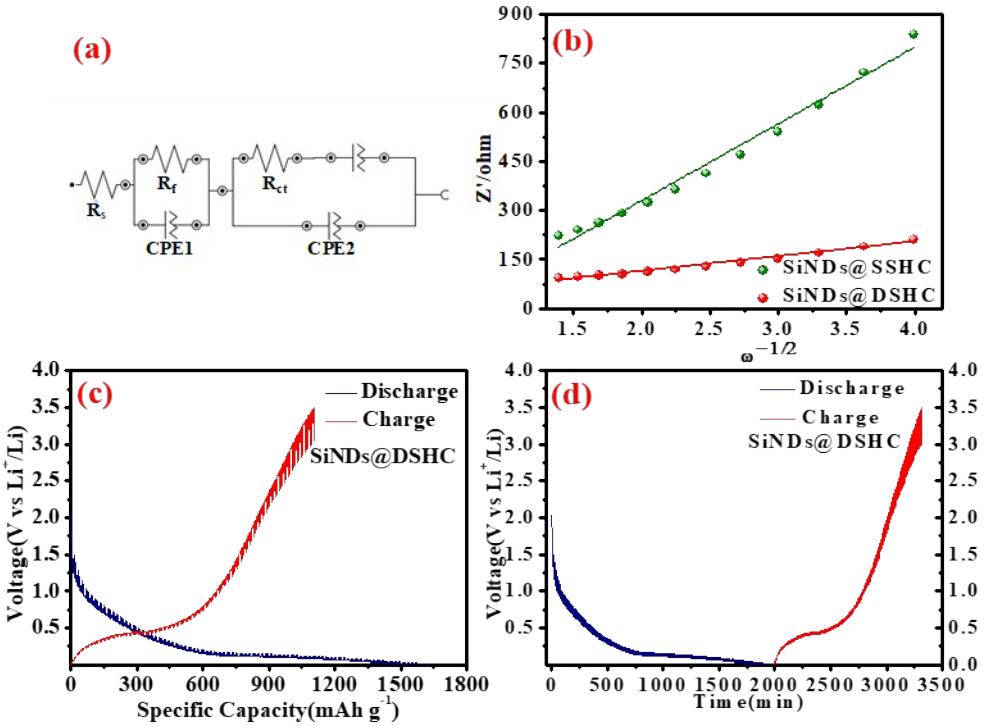


Figure S9. (a) The equivalent circuit. (b) Relationship between Z' and $\omega^{-1/2}$ in the low-frequency region. (c and d) GITT curves of SiNDs@DSHC.

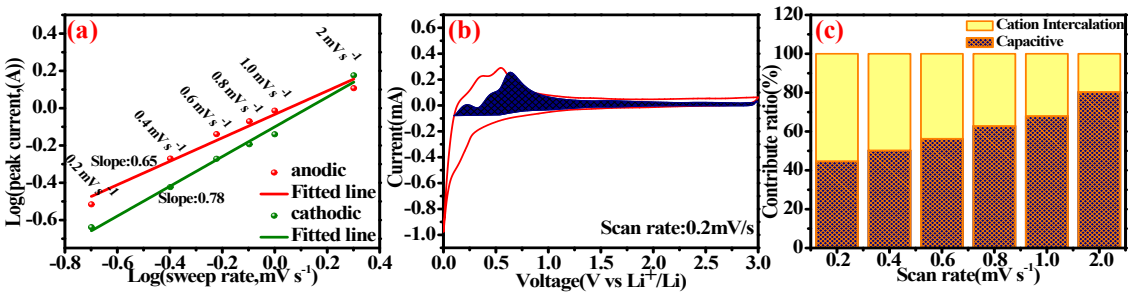


Figure S10. (a) Corresponding log i versus log v plots at each redox peak (peak current: i, scan rate: v) and (b) CV curve with the capacitance control shown by the shaded region at a scan rate of 0.2 mV s^{-1} (c) bar chart showing the percent of capacitance control at different scan rates of SiNDs@DSHC.

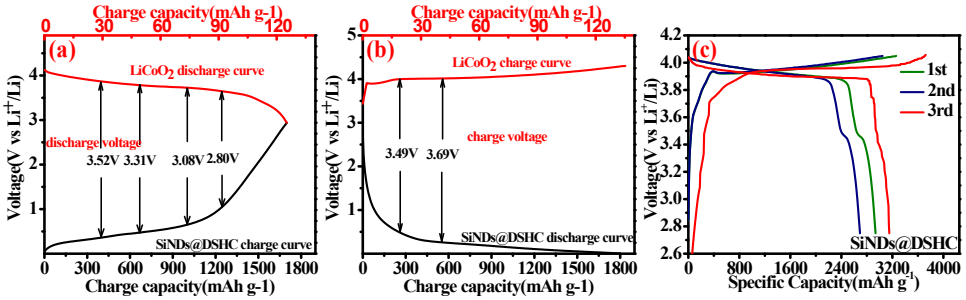


Figure S11. (a) Second discharge ($LiCoO_2$ electrode in the half battery, upper portion) and charge (SiNDs@DSHC composite in the half battery, lower portion) curves. (b) Second charge ($LiCoO_2$ electrode in the half battery, upper portion) and discharge (SiNDs@DSHC composite in the half battery, lower portion) curves. (c) Charge-discharge profiles of SiNDs@DSHC as anode materials in full cells.

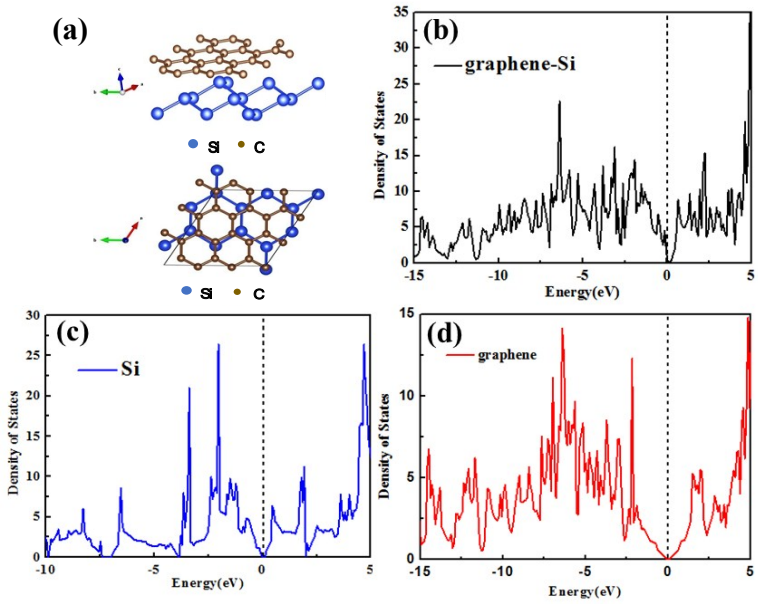


Figure S12. (a) The side view and top view of the interface between single graphene layer and silicon (111) plane, (b) the density of state (DOS) of the heterostructure C/Si, (c) DOSs of individual silicon and (d) graphene.

Table S1. Fitted electrochemical impedance parameters.

Sample	R_s/Ohm	R_f/Ohm	R_{ct}/Ohm
SiNDs@SSHC	**7.7**	**74.3**	**265.0**
SiNDs@DSHC	**7.3**	**44.7**	**30.5**
SiNDs@DSHC after 1000 cycles	**4.6**	**17.8**	**56.3**