Electronic Supplementary Information

Facile and green synthesis approach to derive highly stable SiO_x-Hard carbon based nanocomposites as anode for lithium-ion batteries

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Table S1 Facile weight ratio calculation for all the samples

Sample	Sucrose (g)	TEOS (g)	C-Yield (g)	SiO_x-Yield (g)	HC:SiO_x (Wt ratio)
SOHC-1	8	5	3.36	1.45	~ 1:0.4
SOHC-2	8	6	3.36	1.74	~ 1:0.5
SOHC-3	8	8	3.36	2.32	~ 1:0.6
SOHC-4	8	9	3.36	2.61	~ 1:0.8
SOHC-5	8	11	3.36	3.34	~ 1:1
SOHC-N	8	8	3.36	2.32	~ 1:0.6 + N

Table S2 EDS elemental weight concentration for SOHC-3 and SOHC-N electrodes

Sample	Elemental weight (%)			
	C	**O**	**Si**	**N**
SOHC-3	56.88	30.86	12.25	0.00
SOHC-N	48.38	16.76	13.16	21.69

Table S3 XPS elemental atomic concentration for SOHC-3 and SOHC-N active materials

Sample	Atomic Concentration of the elements (%)			
	C	**O**	**Si**	**N**
SOHC-3	54.45	28.80	16.75	0.00
SOHC-N	50.93	29.85	17.47	1.75

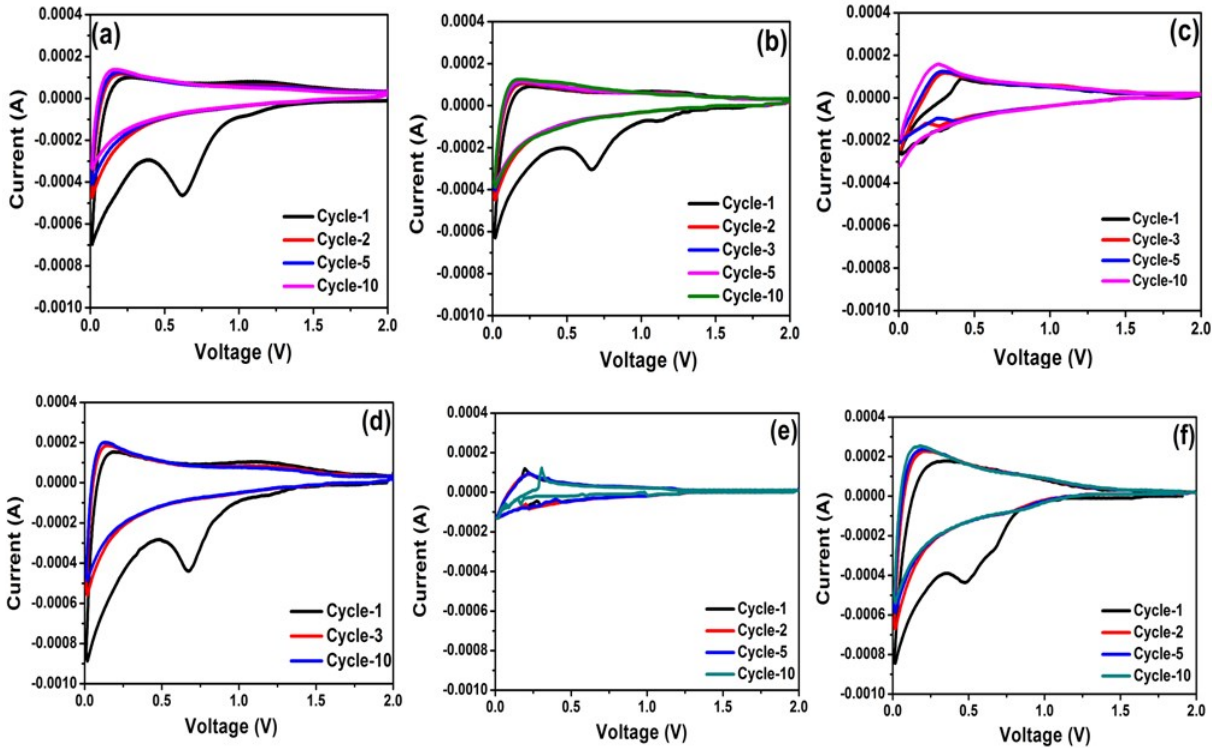

Fig. S1 CV plots for (a) SOHC-1 (b) SOHC-2 (c) SOHC-3 (d) SOHC-4 (e) SOHC-5 (f) SOHC-N anode materials.

Table S4 Electrochemical Performance Comparison between the Previously Reported SiO_x/C based composite anode.

Anode materials	Cycling stability	Rate capability	Ref.
SiO_x/hard carbon (SOHC-3)	456 mAh g^{-1} (500^{th}, 100 mA g^{-1})	622 mAh g^{-1} at 1000 mA g^{-1}	This Work
SiO_x/hard carbon-N (SOHC-N)	~1248.76 mAh g^{-1} (500^{th}, 100 mA g^{-1})	1139.3 mAh g^{-1} at 1000 mA g^{-1}	This Work
SiO_x/C spheres	493.1 mAh g^{-1} (500^{th}, 1 A g^{-1})	146.2 mAh g^{-1} at 10 A g^{-1}	[1]
Ultrafine SiO_x/C nanospheres	~872 mAh g^{-1} (200^{th}, 500 mA g^{-1})	~532 mAh g^{-1} at 2000 mA g^{-1}	[2]
Pea-pod structure of SiO_x/C spheres	~750 mAh g^{-1} (750^{th}, 1000 mA g^{-1})	~427 mAh g^{-1} at 5000 mA g^{-1}	[3]
SiO_x/C composite	~817 mAh g^{-1} (100^{th}, 1000 mA g^{-1})	650 mAh g^{-1} at 0.8 A g^{-1}	[4]
SiO_x/C dual-phase glass	840 mAh g^{-1} (100^{th}, 0.1 A g^{-1})	673 mAh g^{-1} at 0.8 mA g^{-1}	[5]
Core-shell structured SiO_x/nitrogen-doped carbon composite	1514 mAh g^{-1} (100^{th}, 100 mA g^{-1})	1190 mAh g^{-1} at 1000 mA g^{-1}	[6]

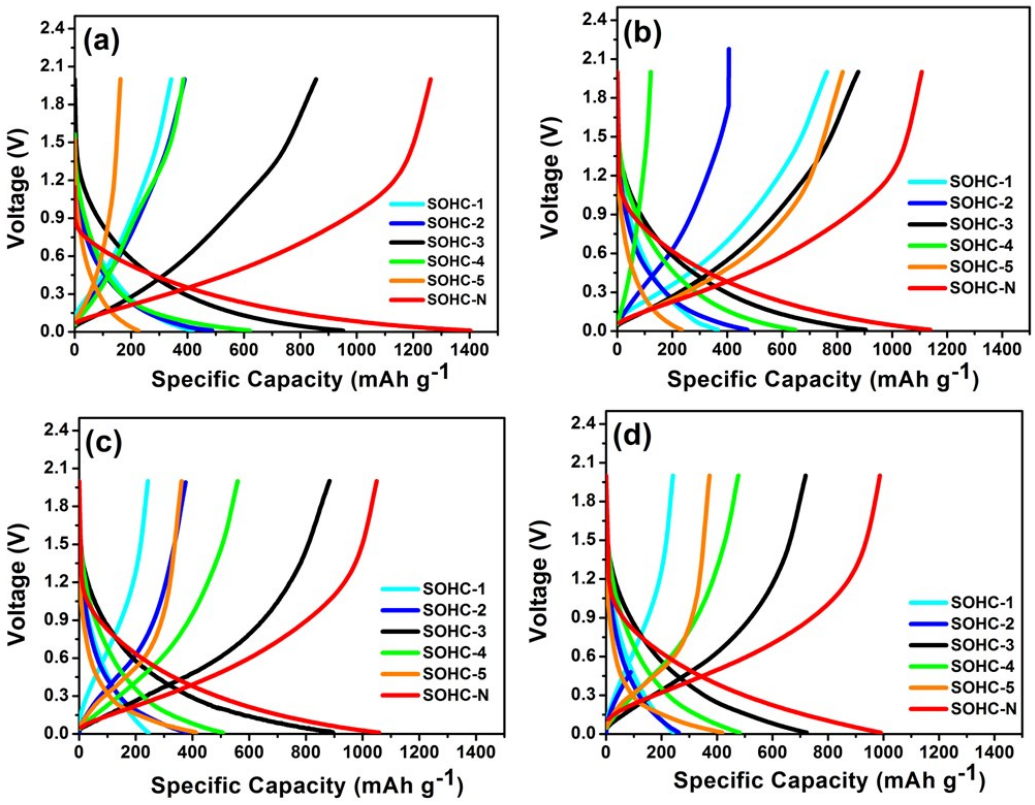

Fig. S2 Galvanostatic charge-discharge plots at (a) 2nd cycle (b) 10th cycle (c) 100th cycle (d) 200th cycle of all the electrodes (SOHC-1 to SOHC-N).

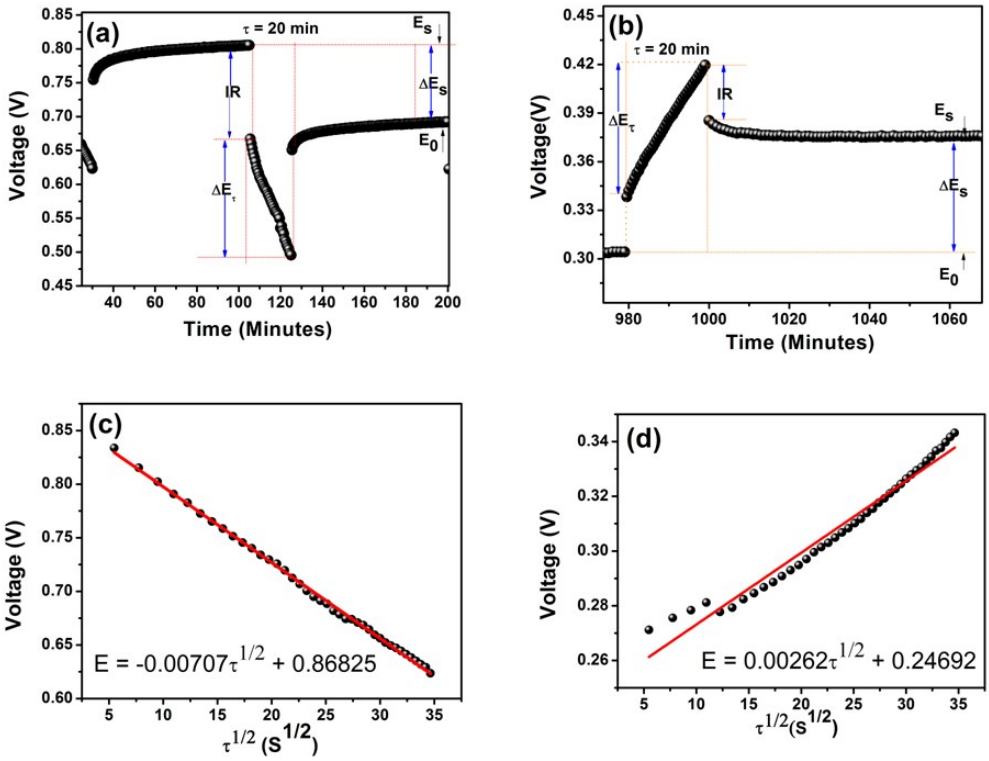

Fig. S3 (a) Single step GITT discharge profile (b) single step GITT charge profile (c) linear fit during discharge condition (d) linear fit during charging condition for SOHC-3 sample.

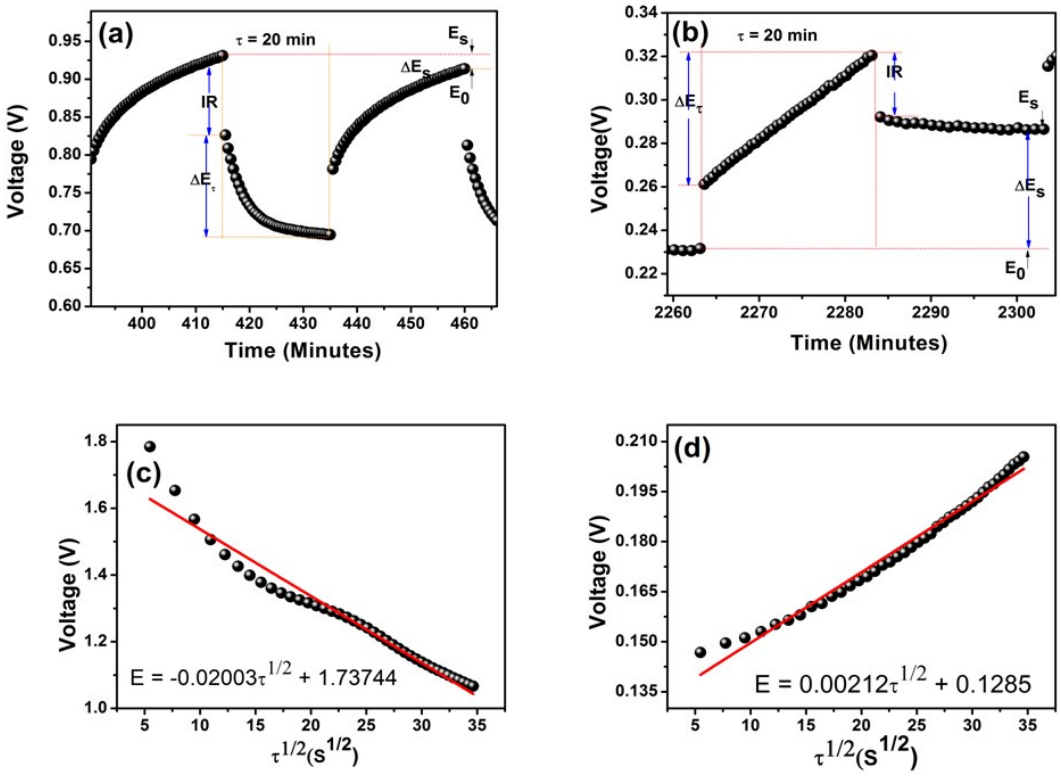

Fig. S4 (a) Single step GITT discharge profile (b) single step GITT charge profile (c) linear fit during discharge condition (d) linear fit during charging condition for SOHC-3 sample.

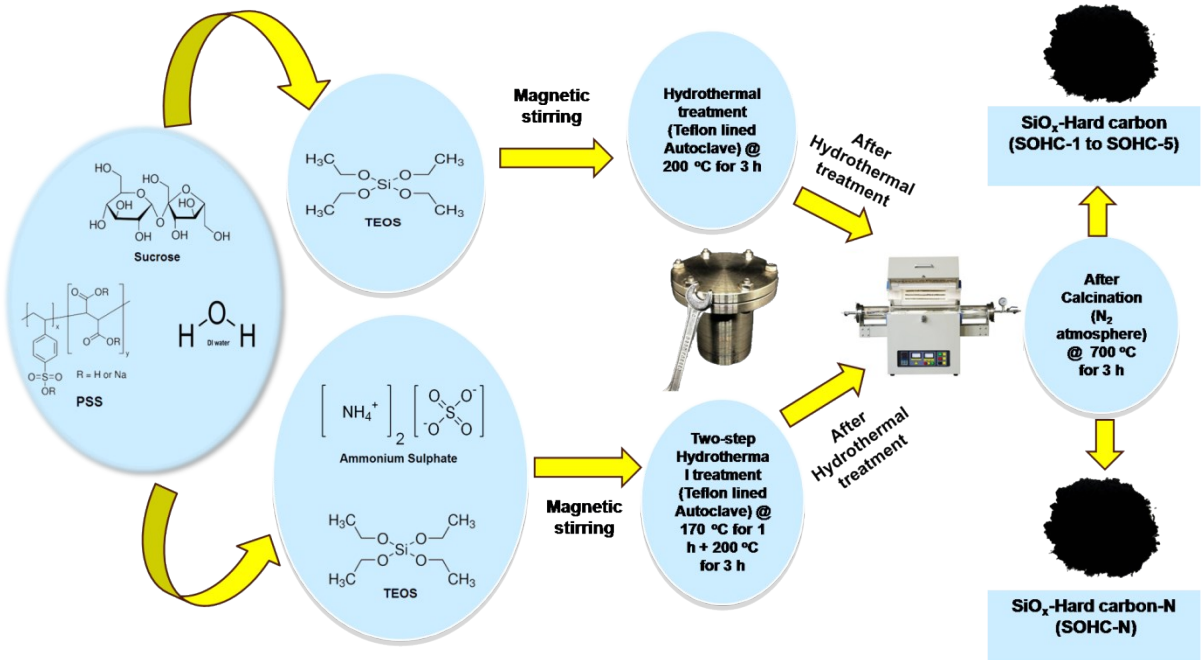

Fig. S5 Schematic representation of the synthesis route followed to derive SOHC-1 to SOHC-N samples for LIB electrode.

Table S5 Composition and weight ratio of the composite samples (SOHC-1 to SOHC-N)

Samples	HC (wt %)	O (wt %)	Si (wt %)	Empirical Formula	Ratio (SiO_x: HC)
SOHC-1	60.38	16.76	13.16	$SiO_{1.27}HC_{4.48}$	0.495 : 1
SOHC-2	65.43	22.77	13.79	$SiO_{1.65}HC_{4.74}$	0.559 : 1
SOHC-3	56.88	22.86	12.25	$SiO_{1.86}HC_{4.64}$	0.617 : 1
SOHC-4	55.80	24.72	24.48	$SiO_{1.009}HC_{2.28}$	0.882 : 1
SOHC-5	55.38	36.17	26.1	$SiO_{1.39}HC_{2.12}$	1.123 : 1

References

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