Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

Poly(ionic liquid)-derived nitrogen-doped hollow carbon spheres: synthesis and loading with Fe_2O_3 for high-performance lithium ion batteries

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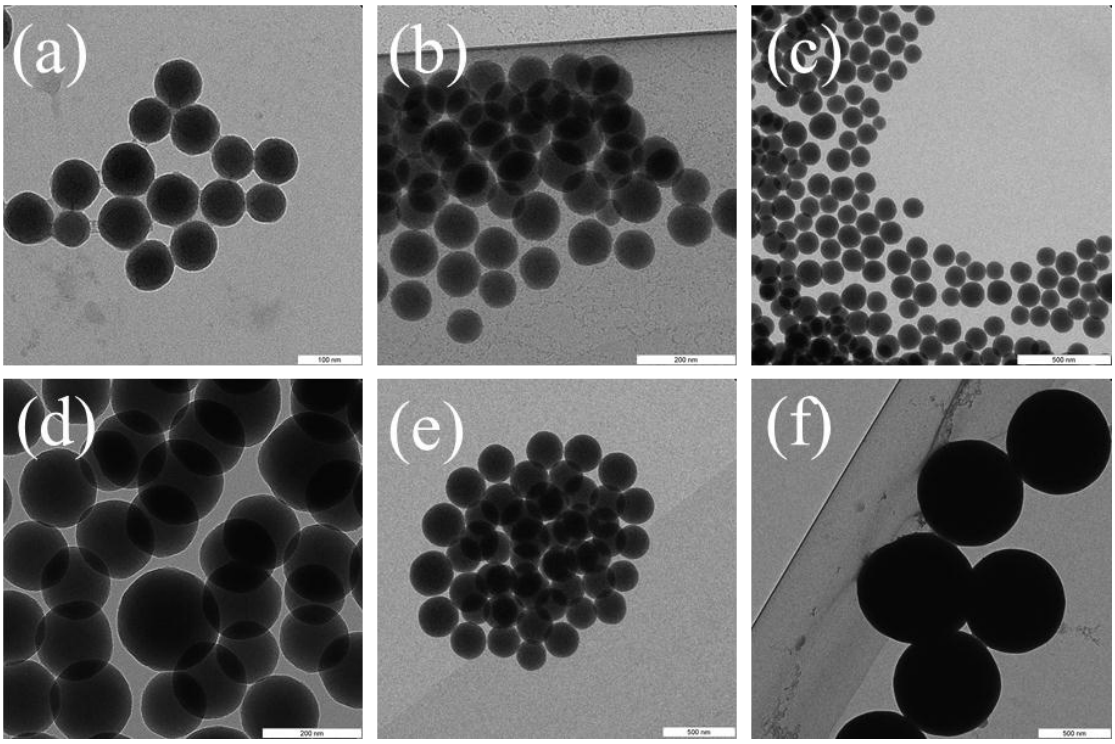

Fig. S1. TEM images of SiO_2 with different size of 70, 90, 130, 180, 250 and 790 nm in (a) to (f) respectively. The scale bars in (a) – (f) are 100, 200, 500, 200, 500 and 500 nm, respectively.

Table S1. Textural properties and nitrogen content of NHCSs.

Sample	AN (mol%)	CL (mol%)	SiO_2 size (nm)		NHCS size (nm)		S_{BET} (m^2 g^{-1})	N content wt%
			DLS	TEM	particle	wall		
NHCS70	-	-	72	71	64	2.6	496	7.6
NHCS90	-	-	89	93	82	2.0	512	7.4
NHCS130	-	-	129	127	121	3.7	571	8.1
NHCS180	-	-	180	174	172	2.1	254	8.0
NHCS250	-	-	256	249	237	2.7	206	8.2
NHCS790	-	-	792	770	780	9.2	19	9.3

AN: acrylonitrile; CL: crosslinking agent; DLS: dynamic light scattering; Particle sizes and wall-thickness of NHCS were estimated by TEM; S_{BET}, BET specific surface area; Nitrogen content was determined by elemental analysis.

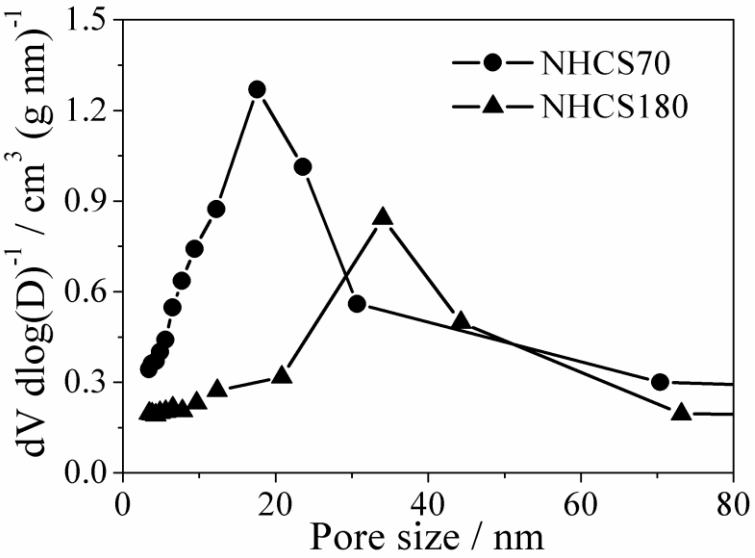

Fig. S2. Pore size distribution plots obtained from the adsorption branch of the isotherms for samples NHCS70 and NHCS180.

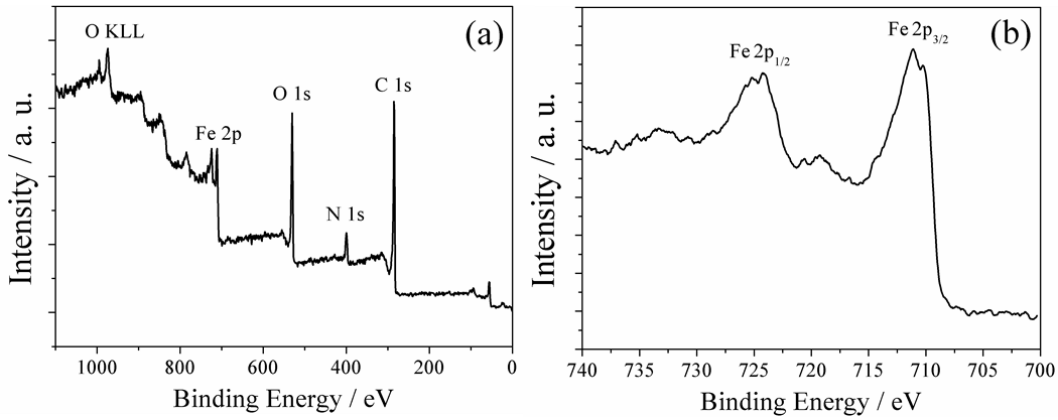

Fig. S3. (a) XPS spectra of Fe_2O_3-NHCS180 composite and (b) XPS spectrum of Fe 2p. The level of $Fe2p_{3/2}$ and $Fe2p_{1/2}$ are 711.1 and 724.2, respectively. In addition, Fig. S3b presents of a satellite peak at 719.0 eV. These results confirm that the iron oxide nanoparticles in the composite are maghemite -Fe_2O_3 rather than Fe_3O_4.

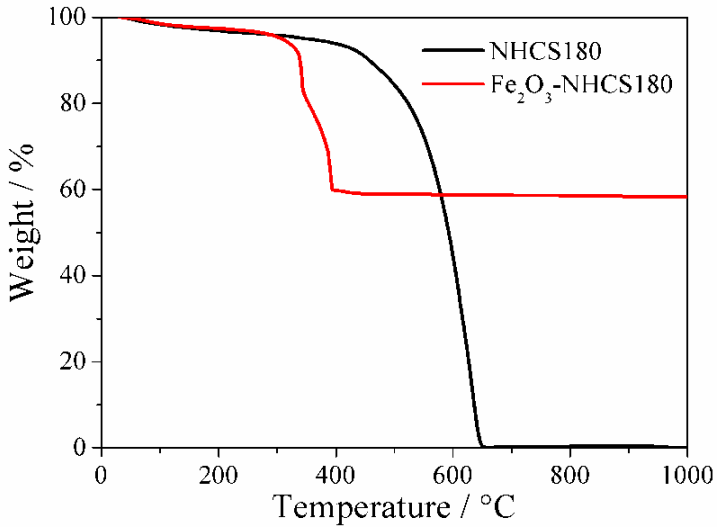

Fig. S4. TG analysis (in air-flow) of NHCS180 (black line) and Fe_2O_3-NHCS180 composite (red line). The Fe_2O_3 content in the composite material was determined to be 57.8 wt%.

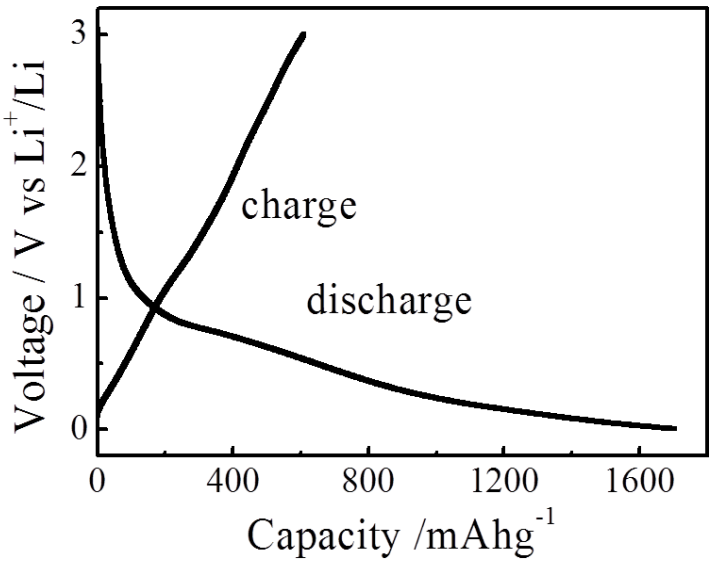

Fig. S5. Discharge and charge curves of NHCS180 at the current density of 100 mA g^{-1} in a voltage window of 0.005-3.00 V.