Supplementary Information

Design and synthesis of nitrogen, sulfur co-doped porous carbon via two-dimensional interlayer confinement for a high-performance anode material for lithium-ion batteries

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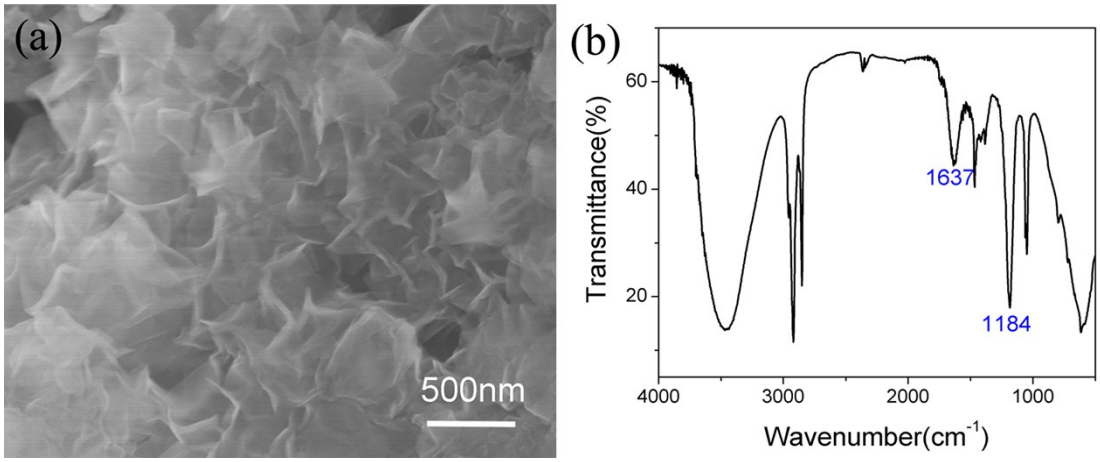

Fig. S1 (a) SEM (b) FI-IR of PVP, DSO-LDH.

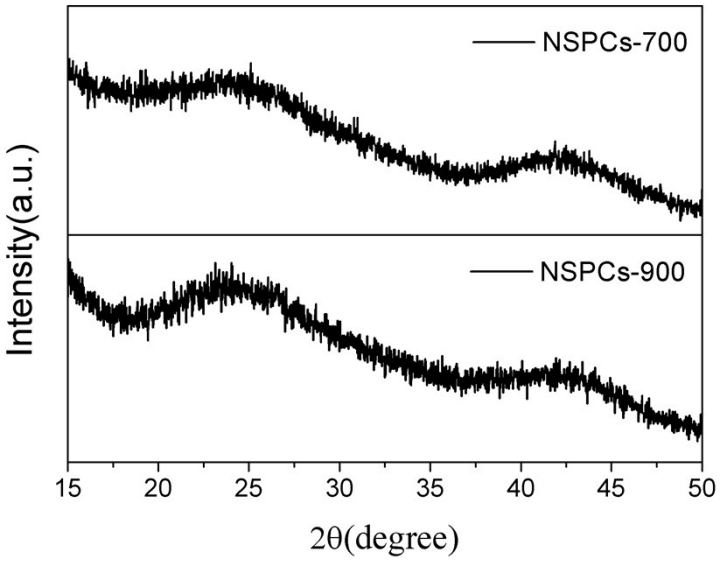

Fig. S2 XRD of NSPCs-700 and NSPCs-900.

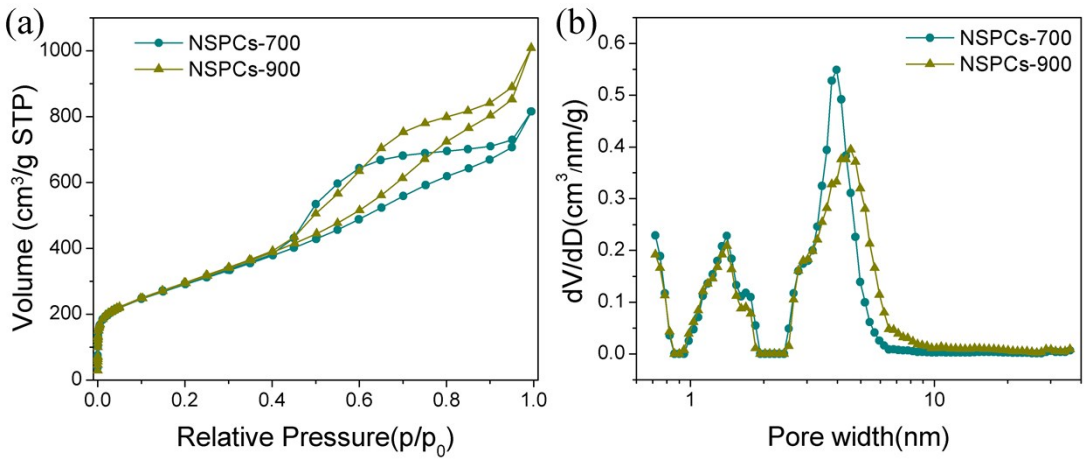

Fig. S3 (a) Nitrogen adsorption-desorption isotherms (b) Pore size distribution of NSPCs-700 and NSPCs-900.

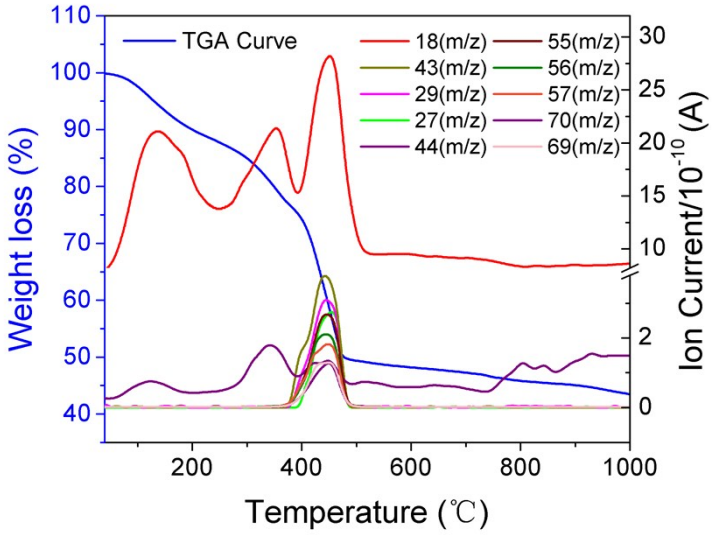

Fig. S4 TG-MS combination analysis for the calcination of PVP, DSO-LDH up to 1000 ºC in argon atmosphere.

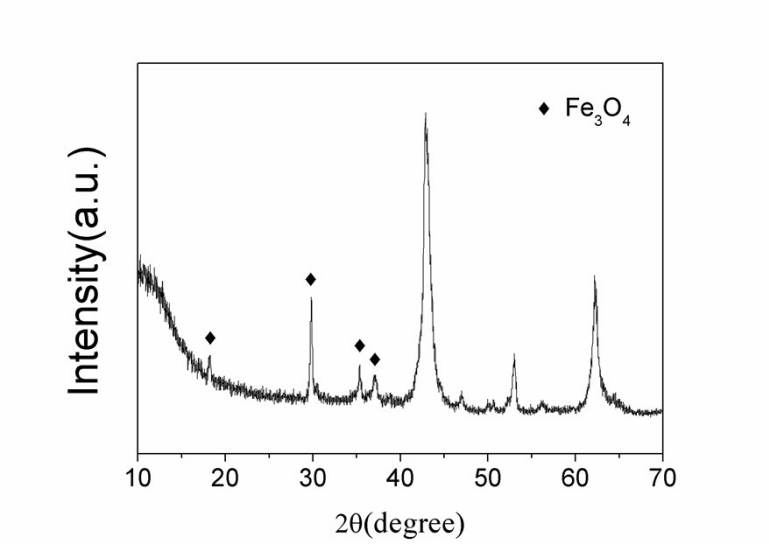

Fig. S5 XRD of calcined PVP, DSO-LDH at 800 °C.

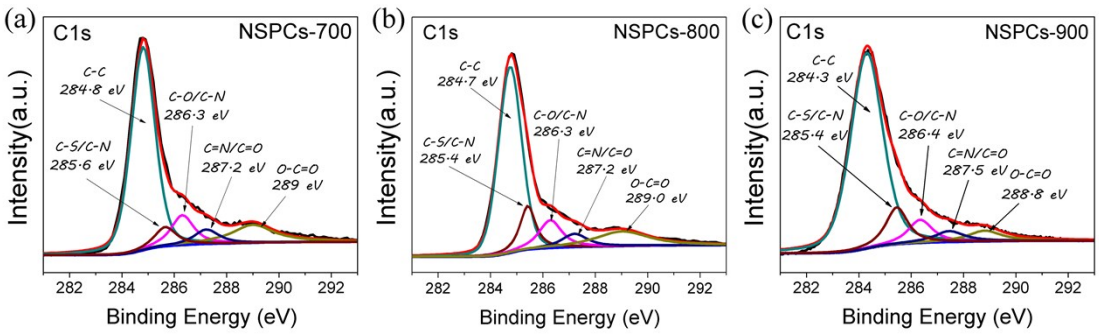

Fig. S6 XPS C1s spectra of (a) NSPCs-700, (b) NSPCs-800 and (c) NSPCs-900.

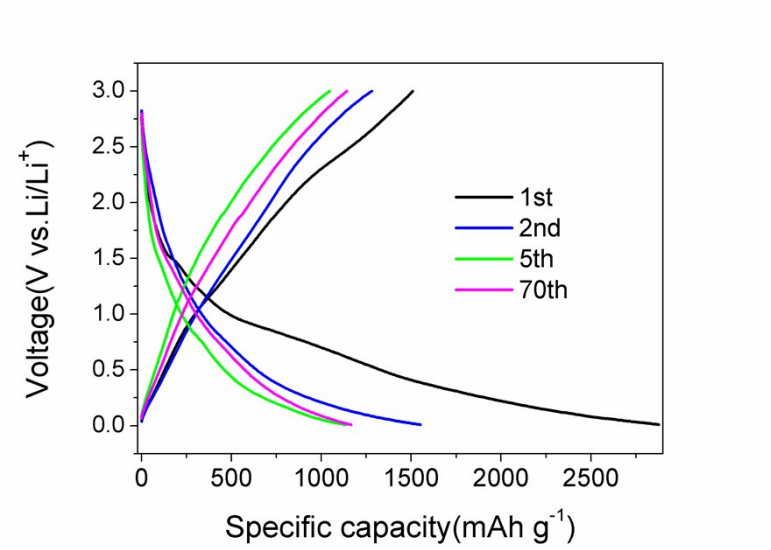

Fig. S7 The galvanostatic charge/discharge profiles of NSPCs-800 at a current density of 0.5C.

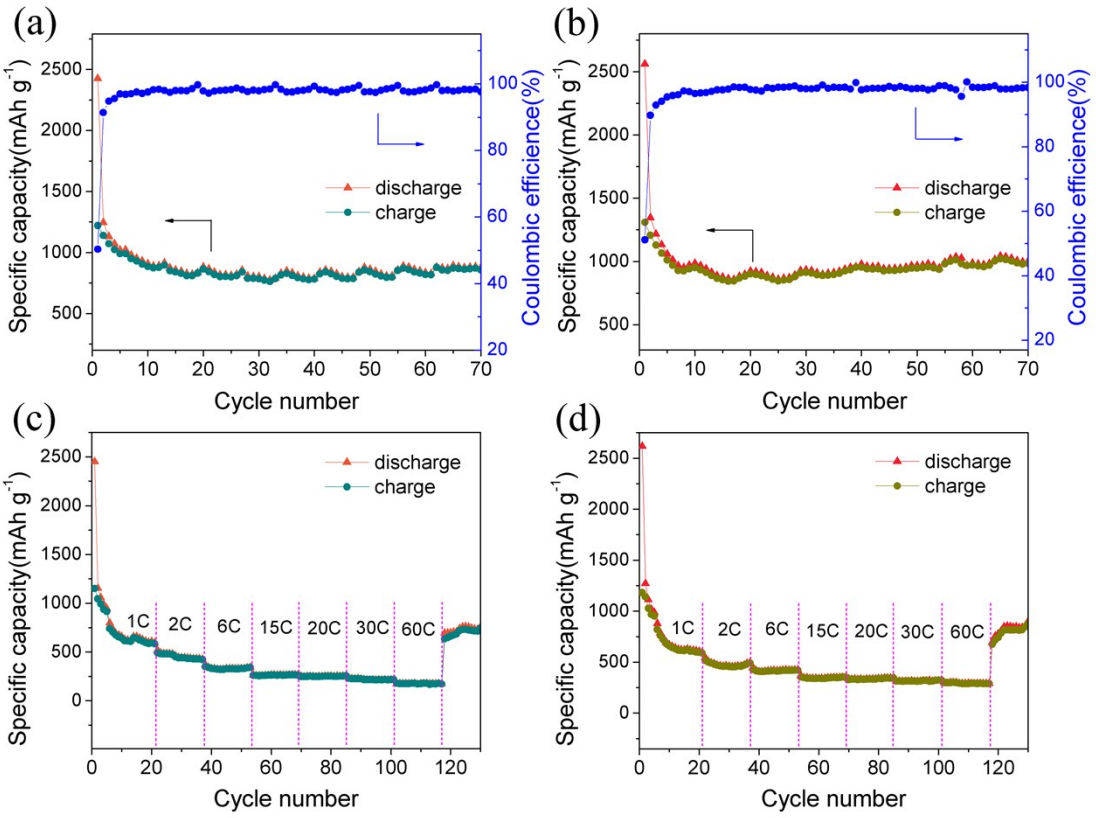

Fig. S8 Cycle performance of (a) NSPCs-700 and (b) NSPCs-900 at a current density of 0.5 C;

Rate performances of (c) NSPCs-700 and (d) NSPCs-900 at different current densities.

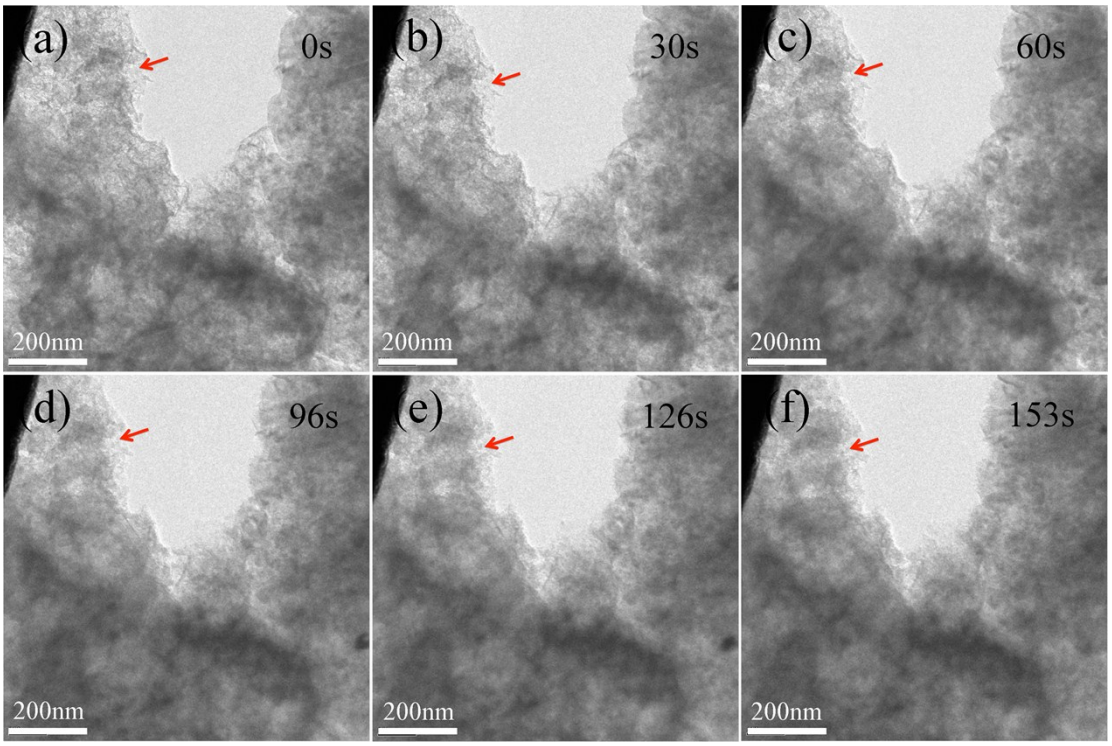

Fig. S9 *In situ* TEM images of lithiation process in NSPCs-800 at different time (a) 0 s, (b) 30 s, (c) 60 s, (d) 96 s, (e) 126 s and (f) 153 s.

Table S1 The concentrations of major nitrogen species of NSPCs.

Sample	N content (at. %)	Pyrrolic N (%)	Pyridinic N (%)	Graphitic N (%)
NSPCs-700	4.2	30.49	40.16	17.40
NSPCs-800	3.8	28.42	36.13	19.26
NSPCs-900	3.5	25.26	31.35	23.59

Table S2 Comparison for electrochemical properties of various doped carbonaceous materials

Materials	Current rate	Specific capacity ($mAh\ g^{-1}$)	Cycle number	Ref
nitrogen-doped graphene sheets	50 mA g^{-1}	1136	50	1
sulfur-doped mesoporous amorphous carbon (SMAC)	200 mA g^{-1}	958	110	2
	500 mA g^{-1}	579	970	
S-doped porous carbon with graphene (SPC@G)	1 A g^{-1} (2.7 C)	780	500	3
N-and S-codoped graphene (NS-G)	200 mA g^{-1}	1090	500	4
sulfur-doped Graphene-based nanosheets (S-GNS)	1488 mA g^{-1} (4 C)	~290	500	5
Nitrogen containing porous carbon (HHC)	50 mA g^{-1} (0.13 C)	~700	50	6
nitrogen-doped graphene (NGr)	2 A g^{-1} (~5.4 C)	453	550	7
N-doped quasigraphene film (GPF)	30 C	220	5000	8
Nitrogen-doped porous double-shelled hollow carbon spheres (N-DHCSs)	1.5 C	512	500	9
Nitrogen-Doped Porous Carbon Nanofiber Webs	2 A g^{-1}	943	600	10
nitrogen, sulfur-codoped graphenelike microspheres (3D NS-GSs)	0.1 A g^{-1}	1117	80	11
N,S co-doped porous carbon materials (NSPCs)	0.5 C (0.4 A g^{-1})	1175	120	Our work
	6 C (3.12 A g^{-1})	504	120	

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