Supplementary Information

Coordination effect of network NiO nanosheet and a carbon layer on the cathode side in constructing a high-performance lithium-sulfur battery

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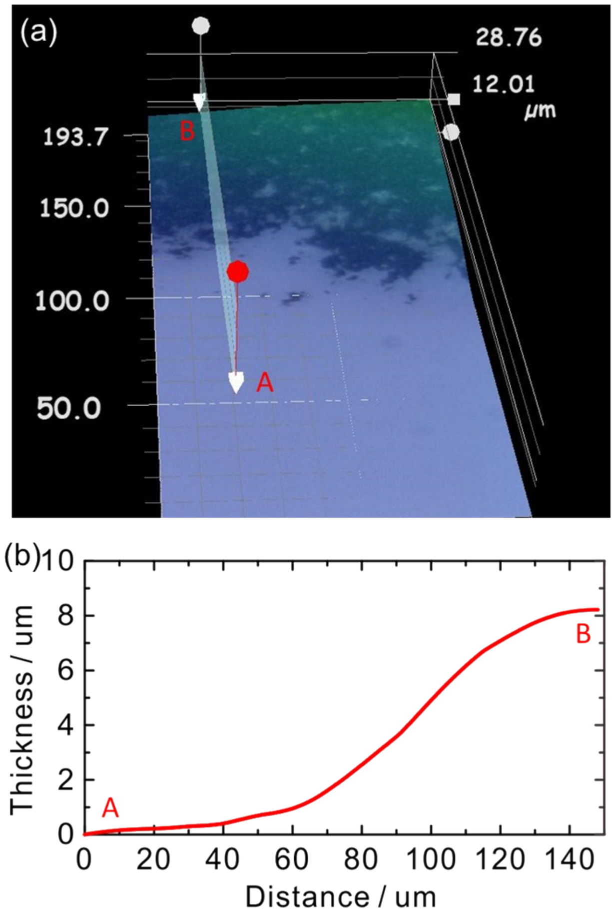

Fig. S1 Three-dimensional stereoscopic microscope image of the separator with carbon layer (a) and the corresponding line profile (b).

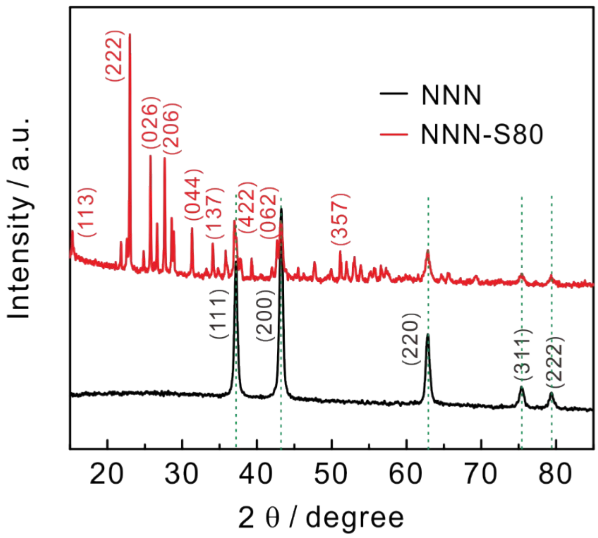

Fig. S2 XRD pattern of original NNN sample.

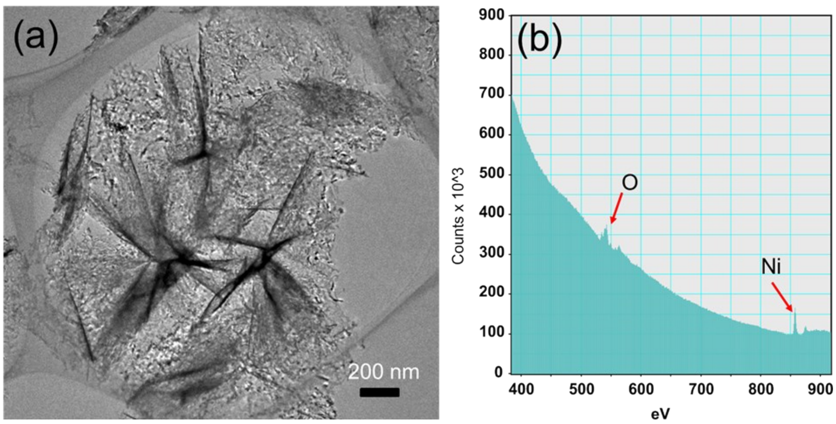

Fig. S3 (a) TEM image and (b) electron energy loss spectrum of NNN sample.

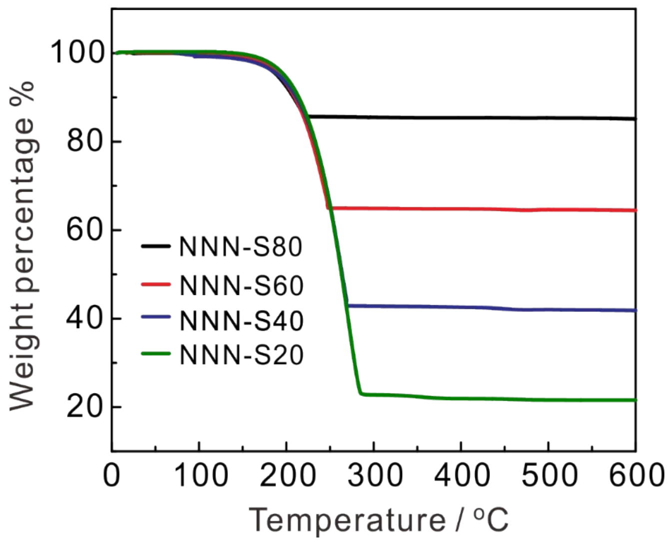

Fig. S4 TGA curves of NNN-S80, NNN-S60, NNN-S40 and NNN-S20 samples.

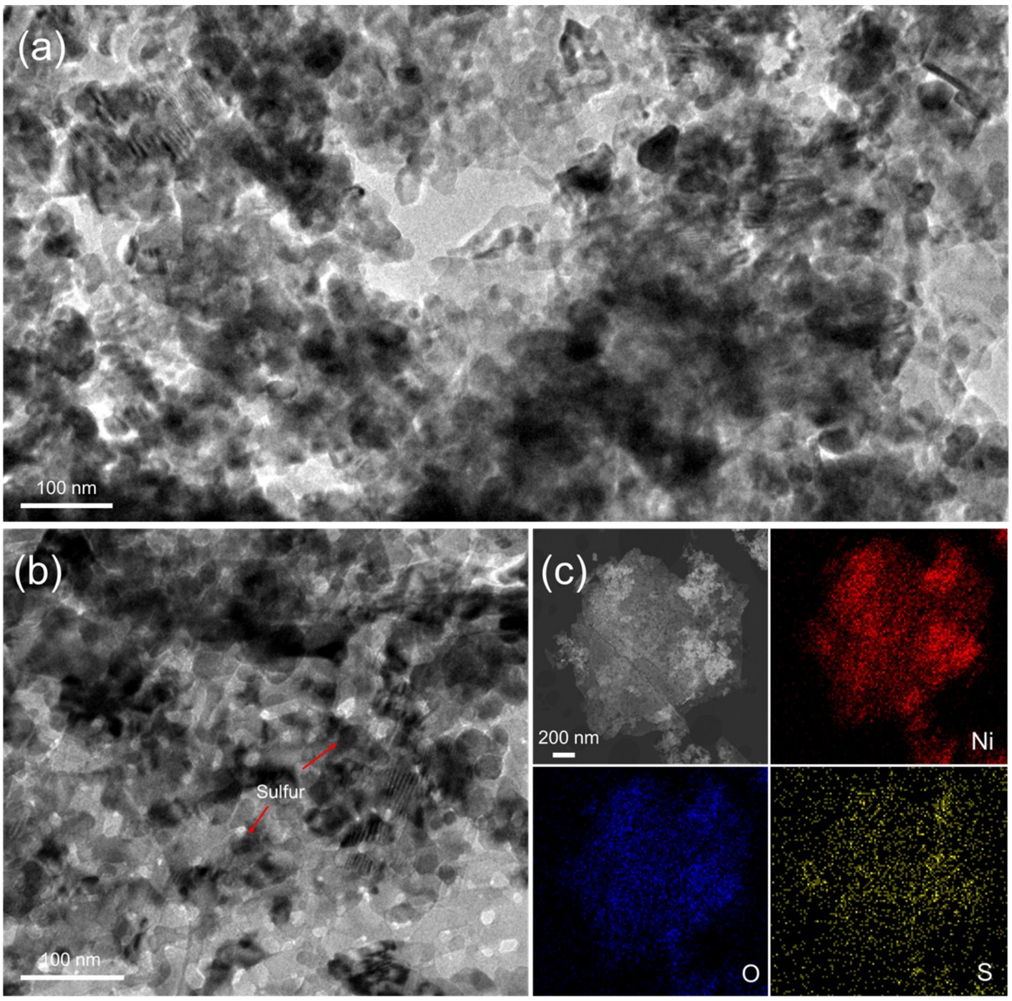

Fig. S5 (a) TEM image of NNN-S80; (b) TEM image of NNN-S20; (c) STEM image of NNN-S20 and the corresponding EDS mapping images of Ni, O and S.

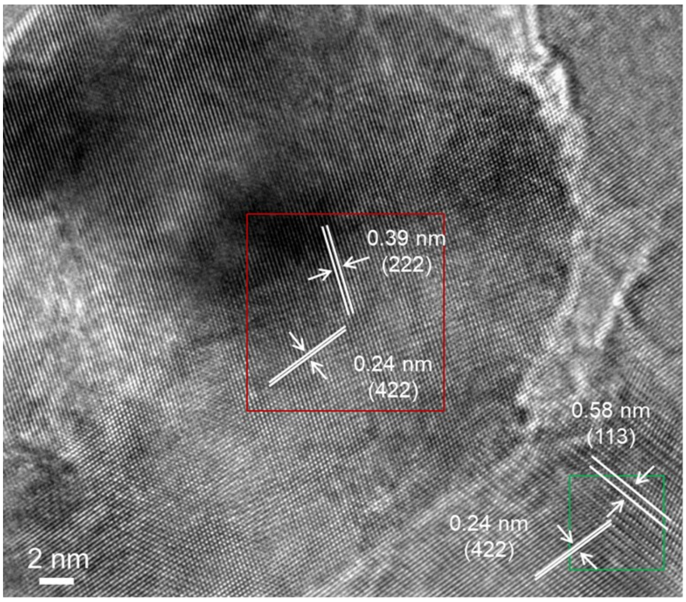

Fig. S6 HRTEM image of NNN-S80 sample.

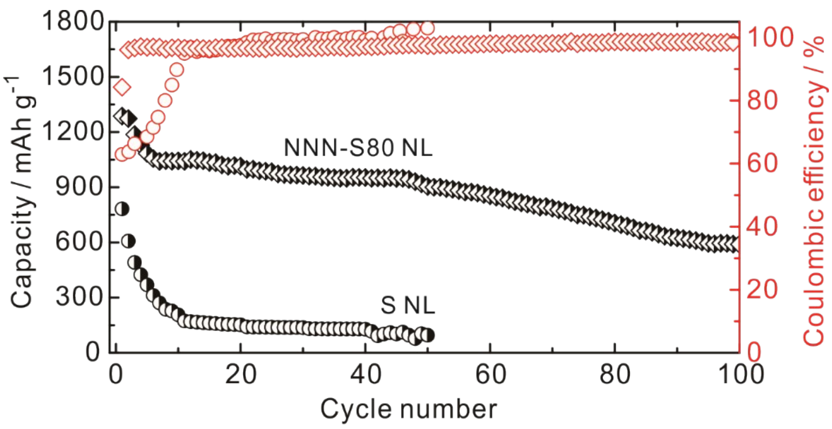

Fig. S7 Discharging curves of Li-S battery at a rate of 0.5 C by using S and NNN-S80 as cathode without carbon layer on the cathode side.

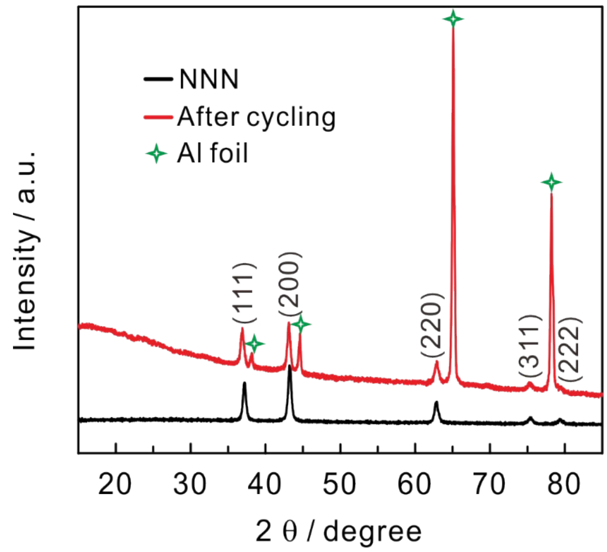

Fig. S8 XRD patterns of NNN and NNN-S80 after 50th cycle at discharge/charge rate of 0.2 C.

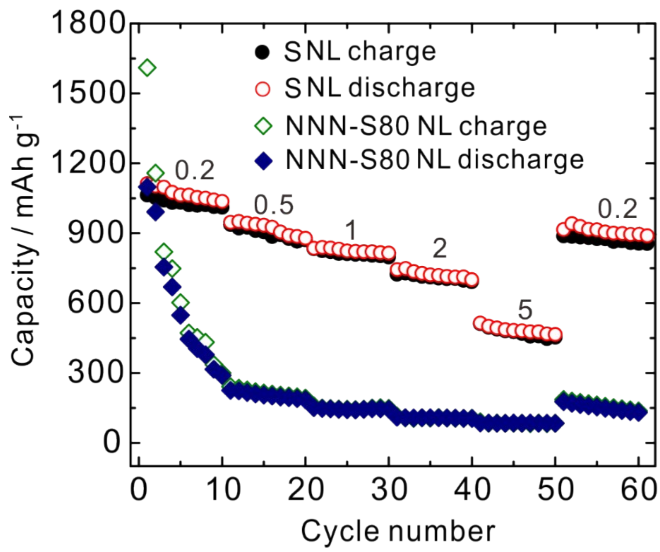

Fig. S9 Rate performance of NNN-S80 NL and S NL cells ranging from discharge/charge rate of 0.2 to 5 C.

Table S1. Comparative electrochemical performances of Li-S battery with different support and construction. Note: * represent the S cathode with materials host, # represents an intercalated layer on the cathode side, ‡ represent the S cathode with transition metal medium.

Materials	Construction type	Initial capacity/ Final capacity	cycles	Rate	Reference
NNN-S80	# with ‡	1100/950	50	0.2C	This work
NNN-S80	# with ‡	992/682	300	2C	This work
S	#	891/518	300	2C	This work
CGF	#	1020/607	200	2C	1
BCFM	#	907/605	300	1C	2
CBC	#	976/620	300	0.5C	3
carbon monolith	#	1000/650	100	0.5C	4
rGO membrane	#	1050/750	100	0.1C	5
graphene/CNTs	#	1370/671	300	0.2C	6
$Ni(OH)_2$@S/CCB	‡	810/564	200	2C	7
S@$Ni(OH)_2$	‡	708/422	1000	1C	8
MnO_2 nanosheet	‡	875/245	2000	2C	9
S@Co–N-GC	‡	1150/625	500	1C	10
hollow S–MnO_2	‡	1110/644	1500	0.5C	11
HGN-S	*	1098/419	1000	1C	12
NPHPC/S	*	810/575	200	1C	13
S/PC-B	*	908/739	100	0.1C	14
S/GN–CNT	*	670/363.5	500	1C	15

Table S2 Relative content of Ni and S after 300 times cycling performed at 2 C (The electrode plate was washed several times with carbon tetrachloride).

Element	At%	$\bar{A}t\%$
	11.26	
Ni	12.58	11.48
	10.60	
	88.74	
S	87.49	88.54
	89.40	

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