Supporting Information

A high-energy-density supercapacitor with multi-shelled nickel-manganese selenide hollow spheres as cathode and double-shell nickel-iron selenide hollow spheres as anode electrodes

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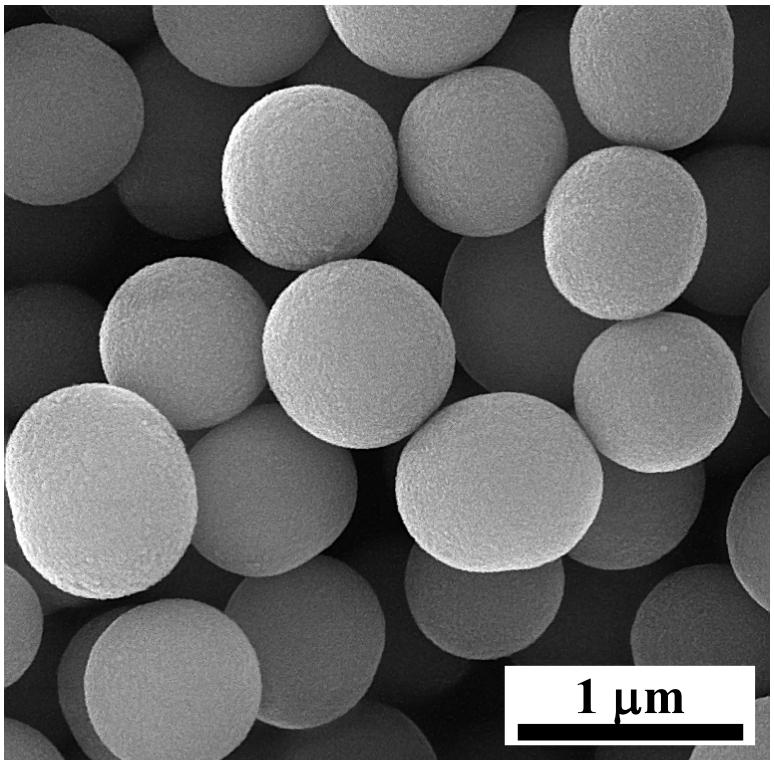

Fig. S1. FE-SEM image of the metal acetate-polysaccharides (MAPs).

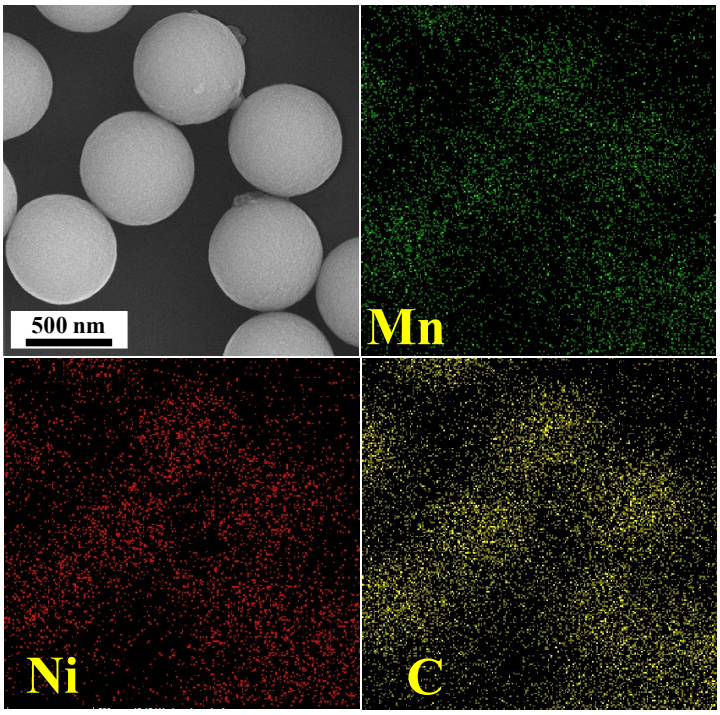

Fig. S2. EDS mapping of the metal acetate-polysaccharides (MAPs).

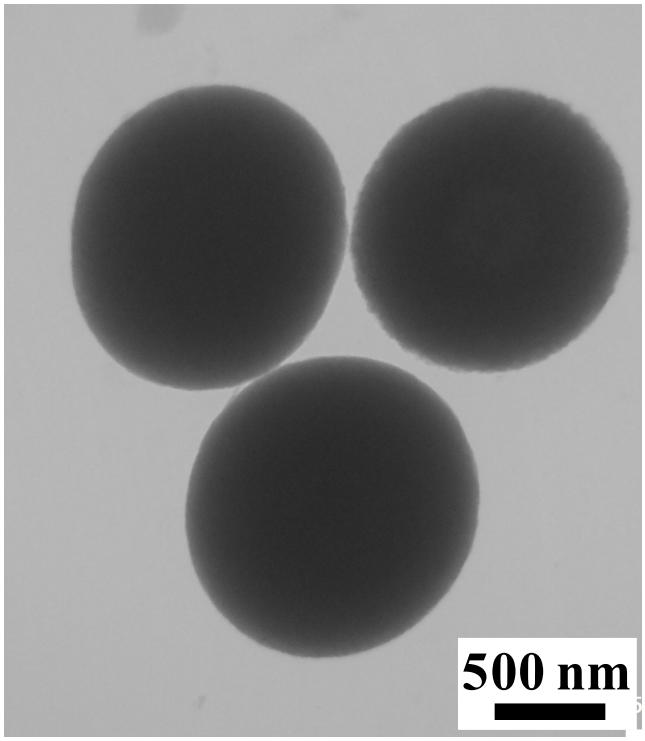

Fig. S3. TEM image of the metal acetate-polysaccharides (MAPs).

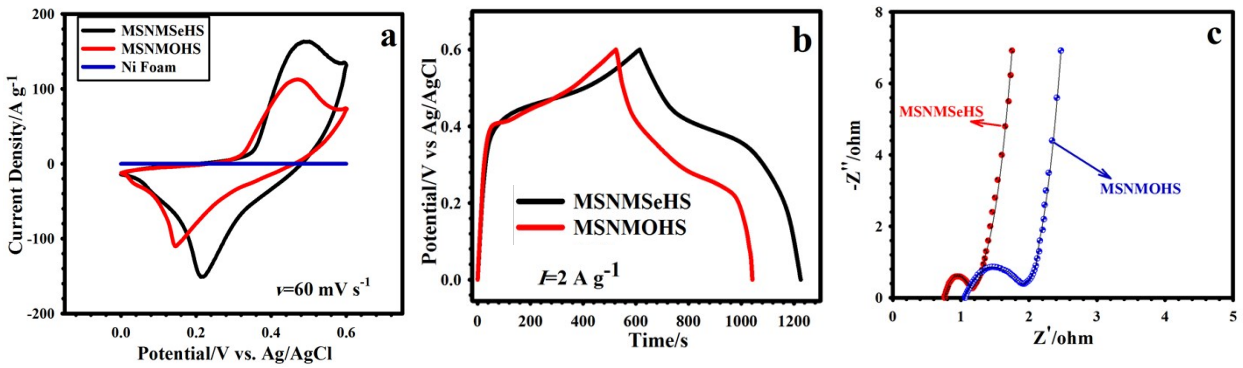

Fig. S4. (a) CV curves of the MSNMSeHS, MSNMOHS, and pure nickel foam at scan rate of 60 mV s^{-1}. (b) GCD curves of the MSNMSeHS, and MSNMOHS at current density of 2 A g^{-1}. (c) Nyquist plots of the MSNMSeHS, and MSNMOHS electrodes.

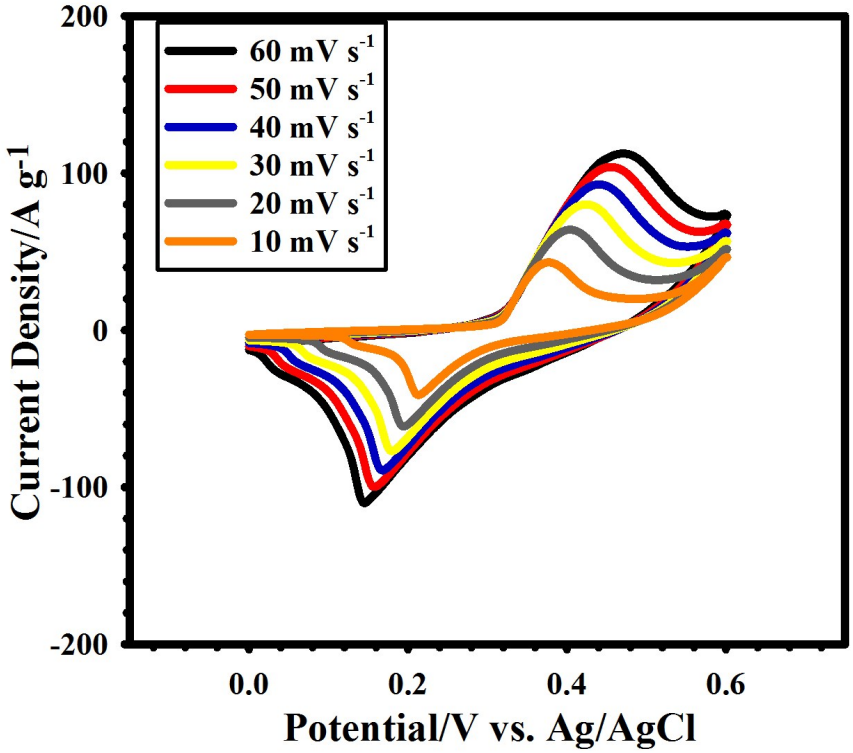

Fig. S5. CV graphs of the MSNMOHS electrode at various scan rates.

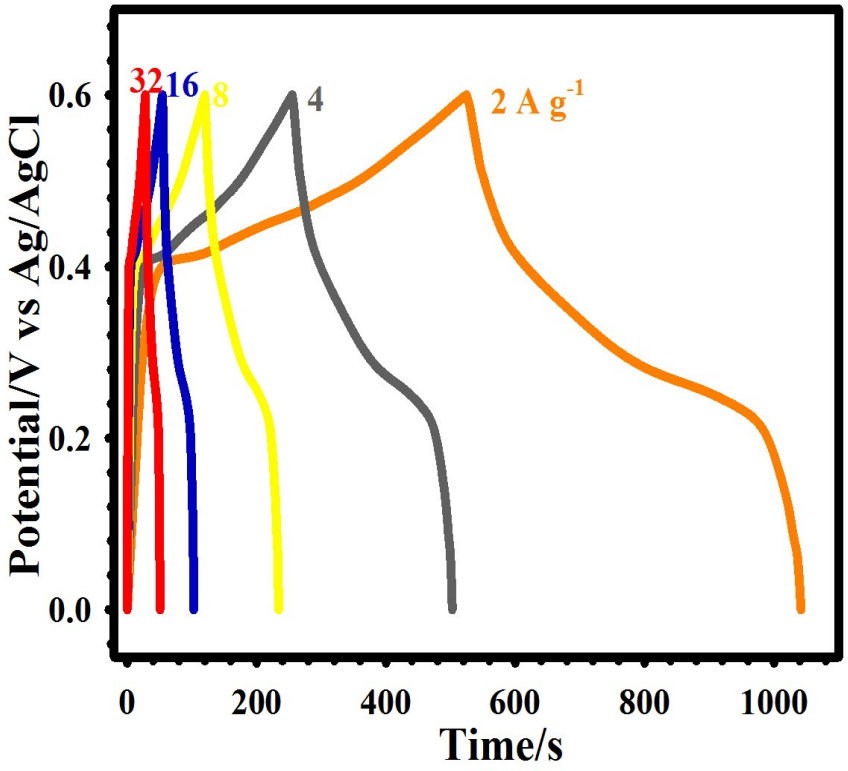

Fig. S6. GCD plots of the MSNMOHS electrode at various current densities.

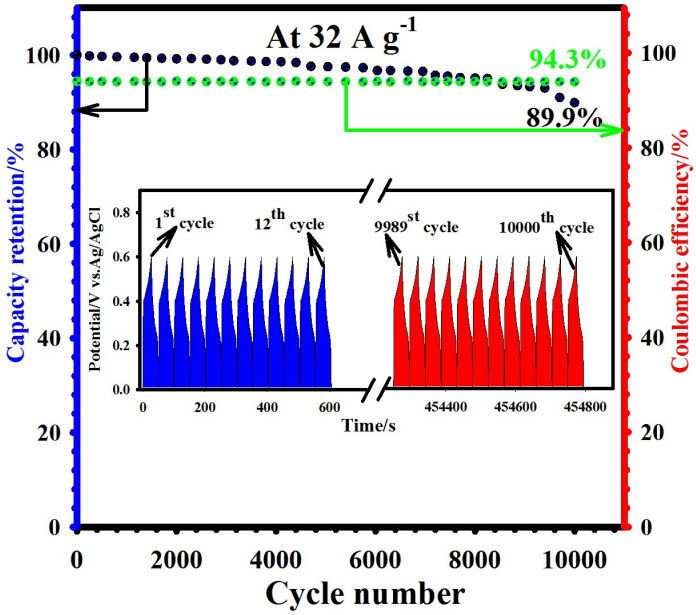

Fig. S7. Durability of the MSNMOHS electrode

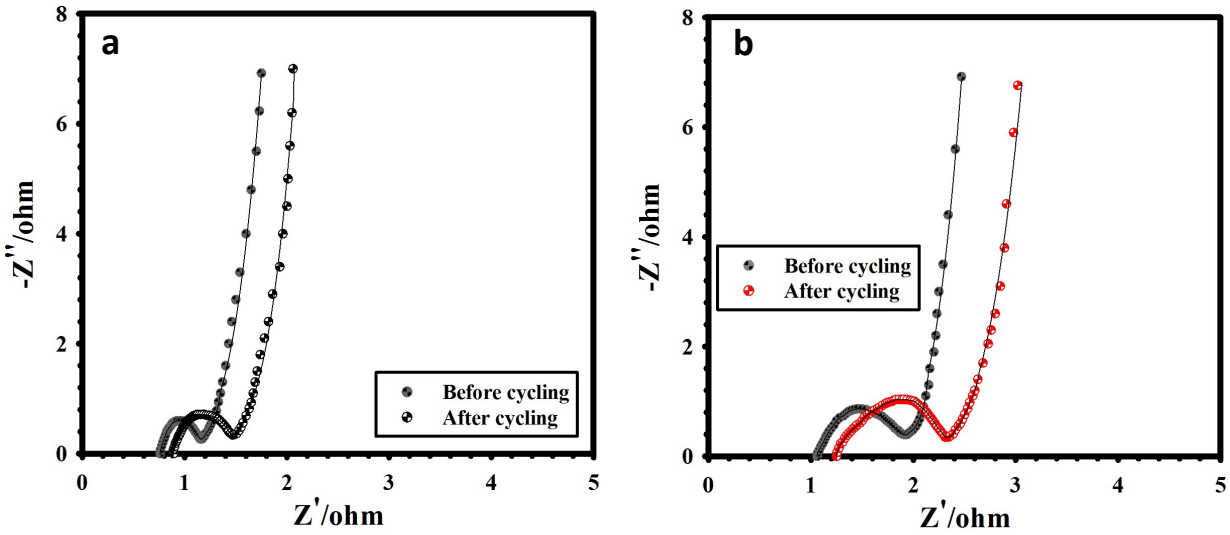

Fig. S8. (a) Nyquist graphs of the MSNMSeHS electrode before and after cycling. (b) Nyquist graphs of the MSNMOHS electrode before and after cycling.

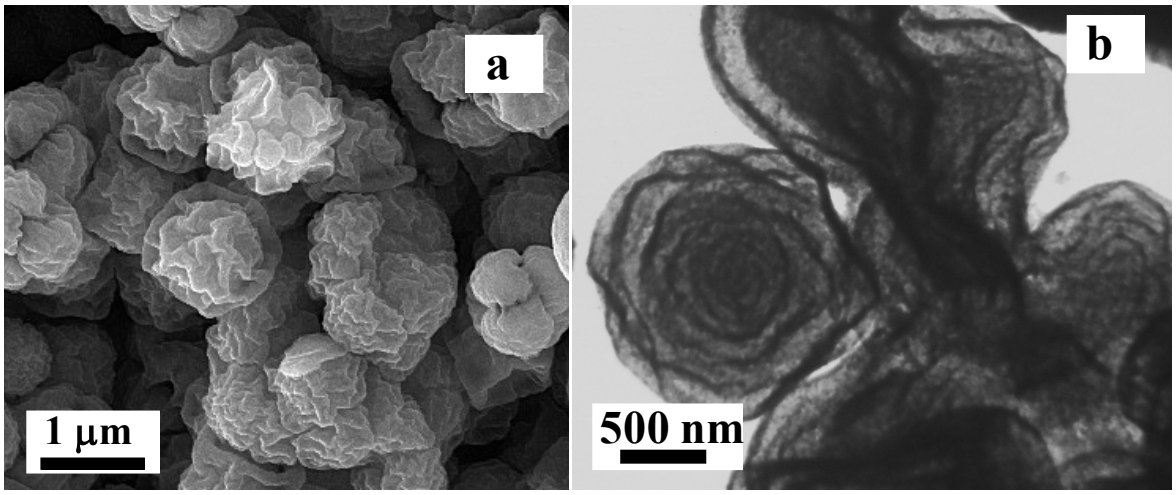

Fig. S9. (a) FE-SEM image of the MSNMSeHS after cycling. (b) TEM image of the MSNMSeHS after cycling.

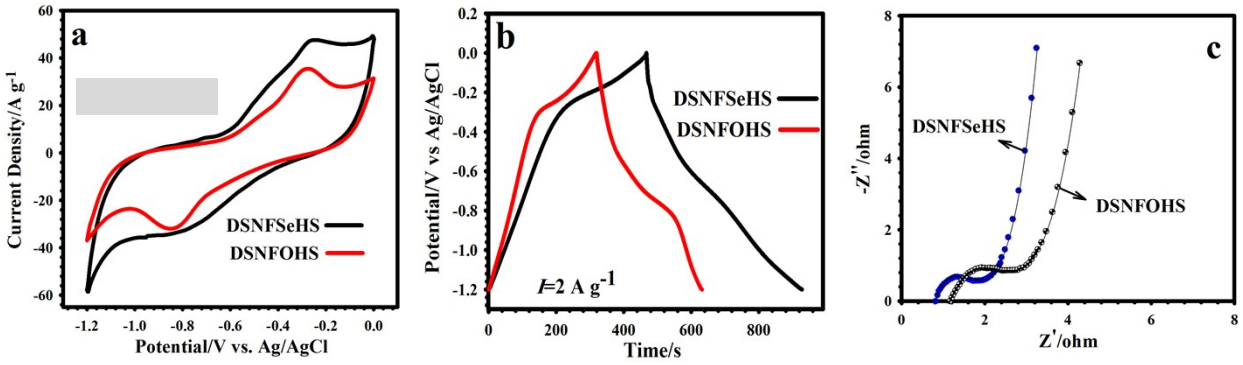

Fig. S10. (a) CV curves of the DSNFSeHS and DSNFOHS electrodes at scan rate of 60 mV s^{-1}. (b) GCD curves of the DSNFSeHS and DSNFOHS electrodes at current density of 2 A g^{-1}. (c) Nyquist plots of the DSNFSeHS and DSNFOHS electrodes.

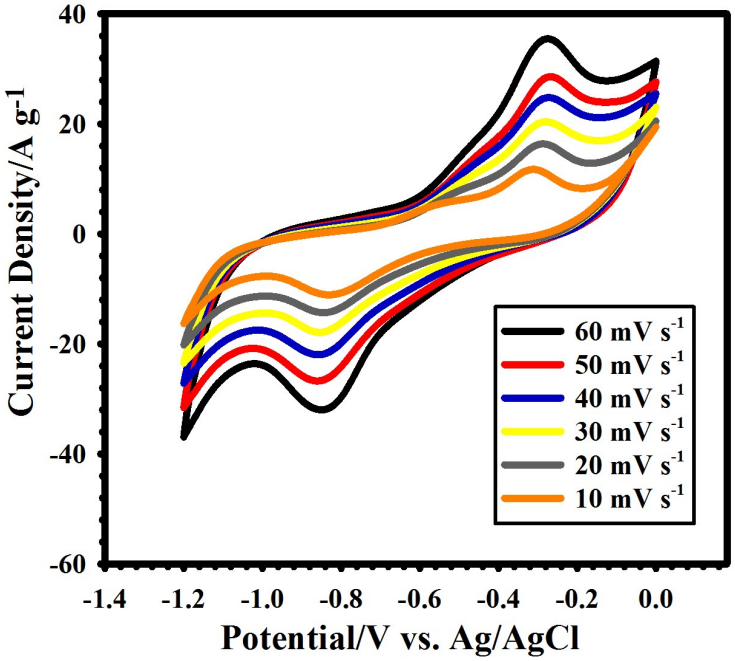

Fig. S11. CV curves of the DSNFOHS electrode at various scan rates

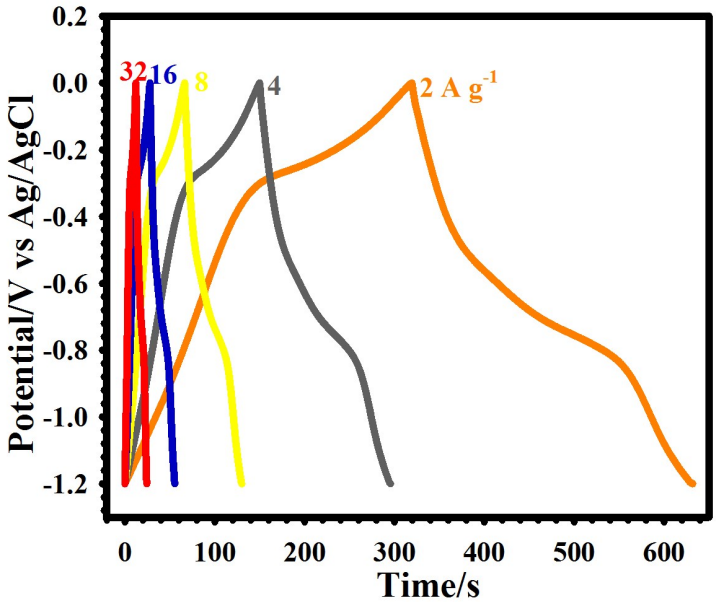

Fig. S12. GCD curves of the DSNFOHS electrode at various current densities.

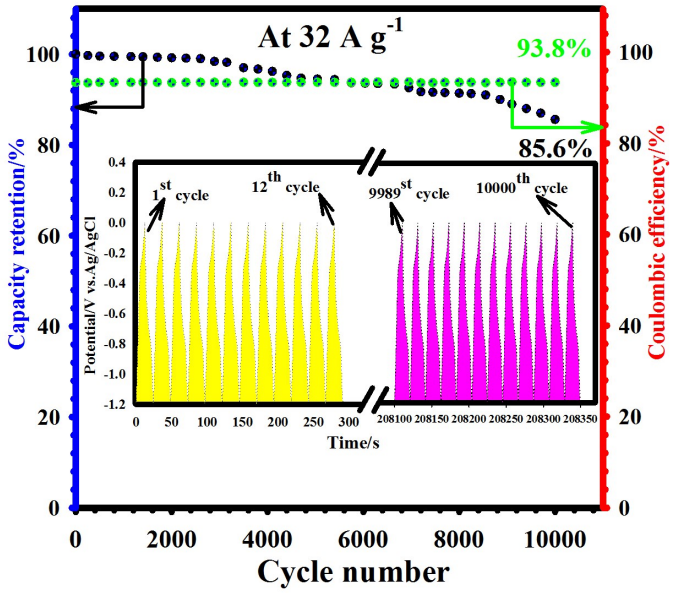

Fig. S13. Durability of the DSNFOHS electrode.

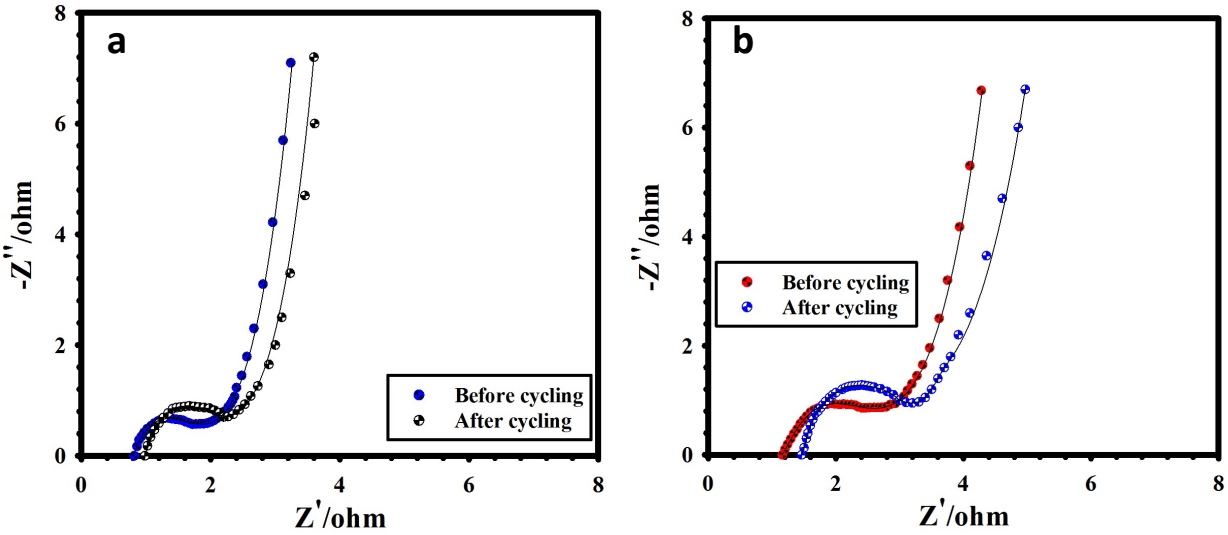

Fig. S14. (a) Nyquist graphs of the DSNFSeHS electrode before and after cycling. (b) Nyquist graphs of the DSNFOHS electrode before and after cycling.

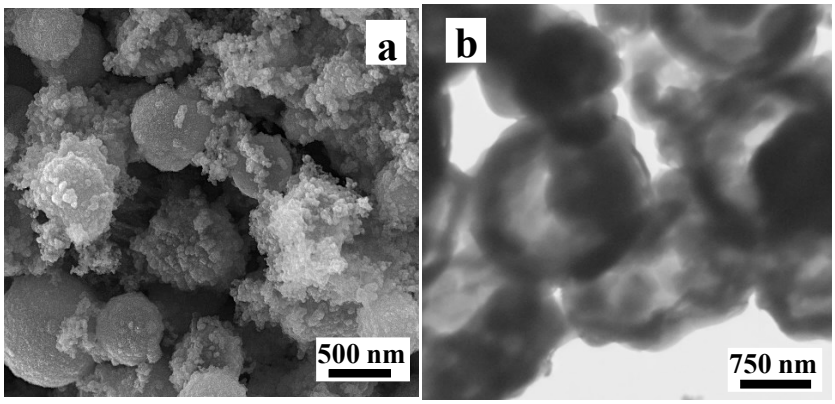

Fig. S15. (a) FE-SEM image of the DSNFSeHS after cycling. (b) TEM image of the DSNFSeHS after cycling.

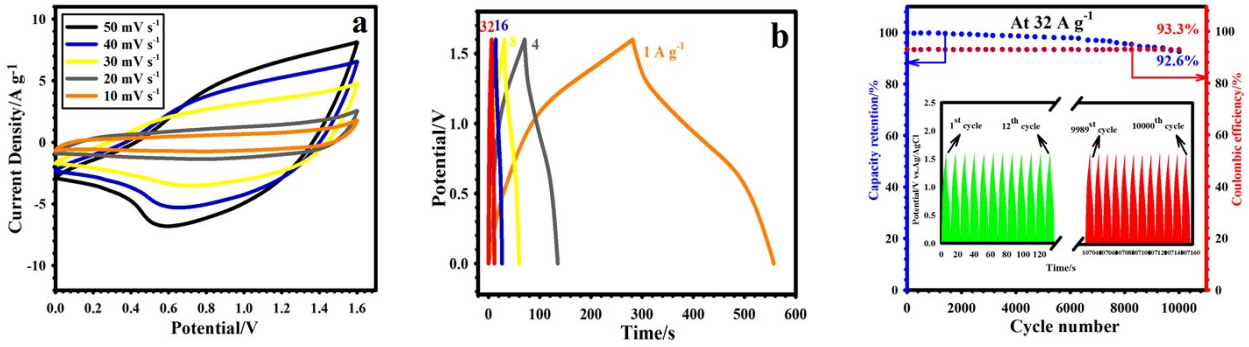

Fig. S16. (a) CV curves of the MSNMSeHS||AC at various scan rates. (b) GCD curves of the MSNMSeHS||AC at various current densities. (c) Durability of the MSNMSeHS||AC device.

Table S1. Comparison of the electrochemical performance of the MSNMSeHS cathode electrode in three and two electrode systems with other previously reported electrodes.

Composition	*Capacity 3 and 2 electrodes (mAh/g or C/g)*	Cycles, retention 2 and 3 electrode	Rate capability, 2 and 3 electrodes	ED (W h kg^{-1}) 2 Electrode	Reference
$Ni_{0.67}Co_{0.33}Se_2$	447 C/g at 1 A/g (3 E)	*2000, 97% (3 E* *5000, 83.3% (2 E)*	56% at 50 A/g (3 E)	38.1	1
$Ni_{0.6}Co_{0.4}Se_2$	602.6 C/g at 1 A/g (3 E)	5000, 91% (2 E)	77.7% at 20 A/g (3 E)	42.1	2
$Ni_{0.85}Se$	114.6 mAh/g at 1 A/g (3 E)	5000, 73.9% (3 E) 5000, 76% (2 E)	60.5% at 10 A/g (3 E)	22.3	3
$Ni_{1.5}Co_{1.5}S_4@Ti_3C_2$-5	166.7 mAh/g at 1 A/g (3 E)	3000, 78.7% (3 E) 8000, 90% (2 E)	73.9% at 20 A/g (3 E)	49.8	4
Copper cobalt selenide	562 C/g at 1 A/g(3 E)	5000, 94.5% (3 E)	73% at 60 A/g (3 E)	32.4	5
$NiSe_2$/rGO	137.7 mAh/g at 1 A/g (3 E)	2500, 80.7% (3 E) 10000, 80% (2 E)	-	33.13	6
Co-Cd-Se	192 mAh/g at 1 A/g (3 E)	1000, 95.2% (3 E) 1000, 80.9% (2 E)	-	57.6	7
$CoSe_2/MoSe_2$-3-1	211.97 mAh/g at 1 A/g (3 E)	2000, 94.2% (3 E) 10000, 93.4% (2 E)	67.8% at 30 A/g (3 E)	51.84	8
MSNMSeHS	339.2 mAh/g/1221.1 C/g (3 E) 125.1 mAh/g/ 450.36 C/g at 1 A/g (2 E)	10000, 95.7 (3 E) 10000, 94.4 (2 E)	78.8% at 32 A/g (3 E)	112.6	This work

Table S2. Comparison of the electrochemical performance of the DSNFSeHS anode electrode in three electrode system with other previously reported electrodes.

Composition	**Capacity 3 electrode (mAh g^{-1} or C g^{-1})**	**Cycles, retention 3 electrode**	**Rate capability 3 electrodes**	**Reference**	
Fe_2O_3@Fe_3C@C	**611 C g^{-1} at 1 A g^{-1} (3 E)**	**-**	**%68.41 at 10 A/g**	**9**	
Fe_2O_3@NG/CFC	**66.1 mAh/g at 2 A g^{-1}**	**10000, 95.1%**	**69% at 50 A/g**	**10**	
Fe_2O_3	**81.9 mAh/g at 1 A g^{-1}**	**5000, 84.2%**	**55.6% at 20 A/g**	**11**	
P–FeS_2/GNS	**246 mAh/g at 3 A/g**	**5000, 93%**	**-**	**12**	
FeS_2	**515 C/g at 1 A g^{-1} (3 E)**	**-**	**65% at 20 A/g**	**13**	
FeS_2/GNS	**793 C/g at 3 A g^{-1}**	**-**	**82% at 30 A/g**	**14**	
Fe_2O_3@NG	**145.3 mAh/g at 1 A/g**	**10000, 89.5%**	**57.7% at 50 A/g**	**15**	
Fe_2O_3/G	**48 mAh/g at 0.5 A/g**	**5000, 92.5%**	**57.7% at 20 A/g**	**16**	
DSNFSeHS	**258.4 mAh/g/930.25 C/g**	**10000, 90.9%**	**75.5% at 32 A/g**	**This work**	

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