Electronic Supplementary Material (ESI) for Nanoscale.
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Supporting information

Formation of graphene-wrapped multi-shelled $NiGa_2O_4$ hollow spheres and graphene-wrapped yolk-shell $NiFe_2O_4$ hollow spheres derived from metal–organic frameworks for high-performance hybrid supercapacitors

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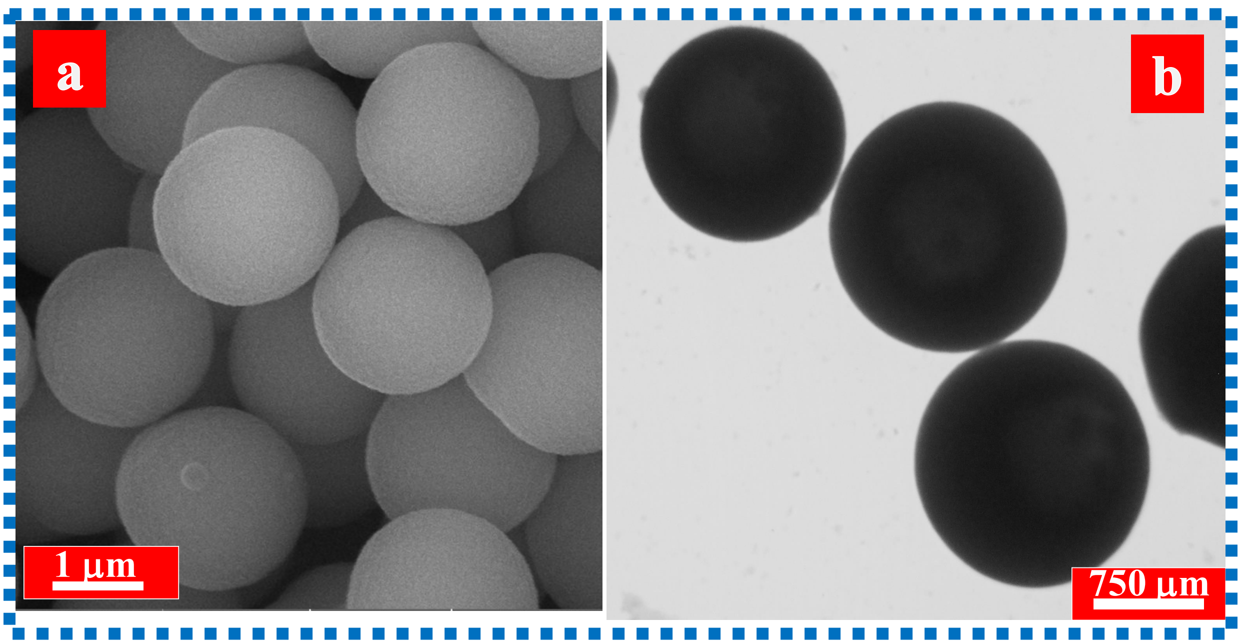

Fig. S1. *FE-SEM and TEM images of Ni-Ga precursor*

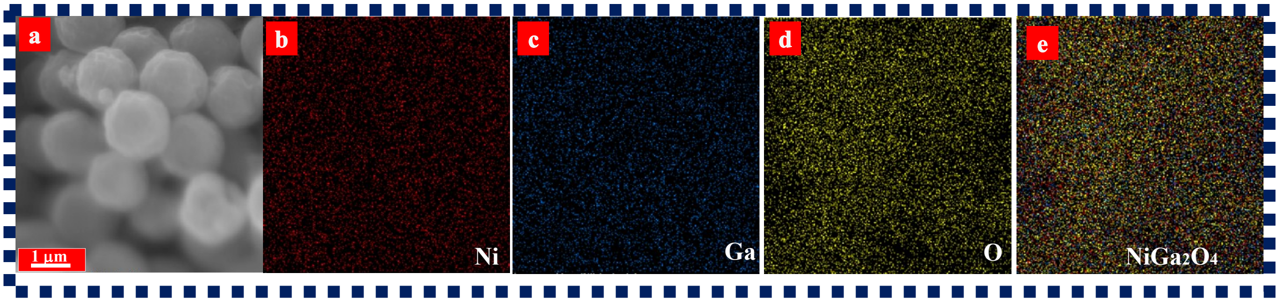

Fig. S2. *Elemental mapping image of MSNGOHS sample*

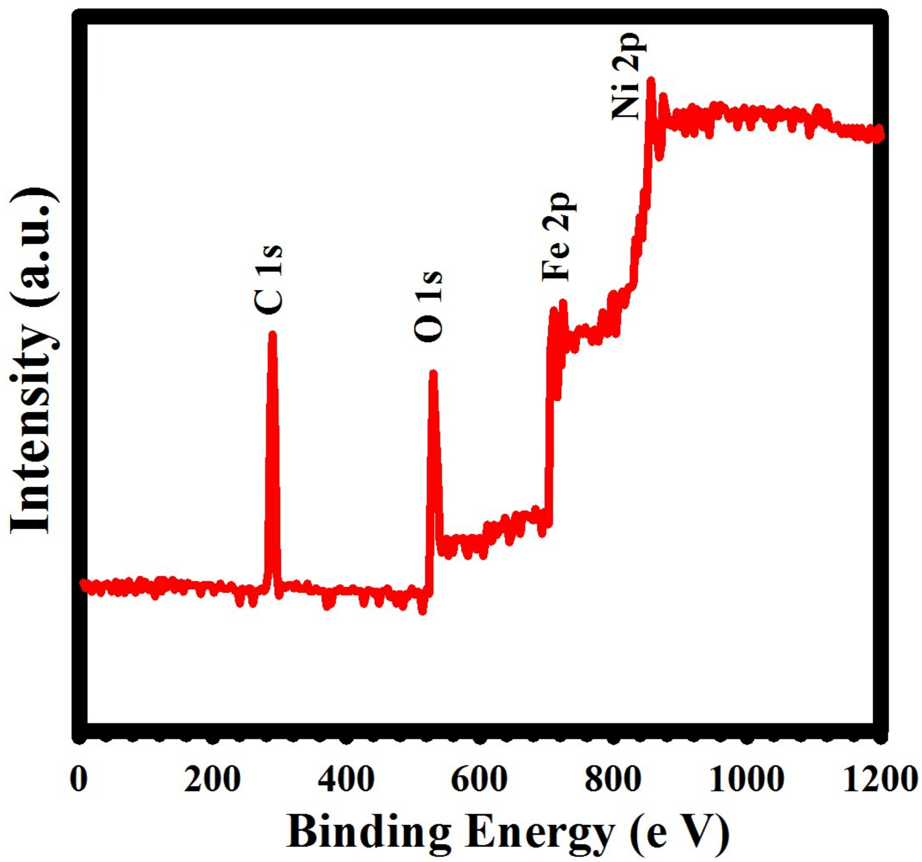

Fig. S3. *Survey spectrum of the GW-YS-NFOHS sample.*

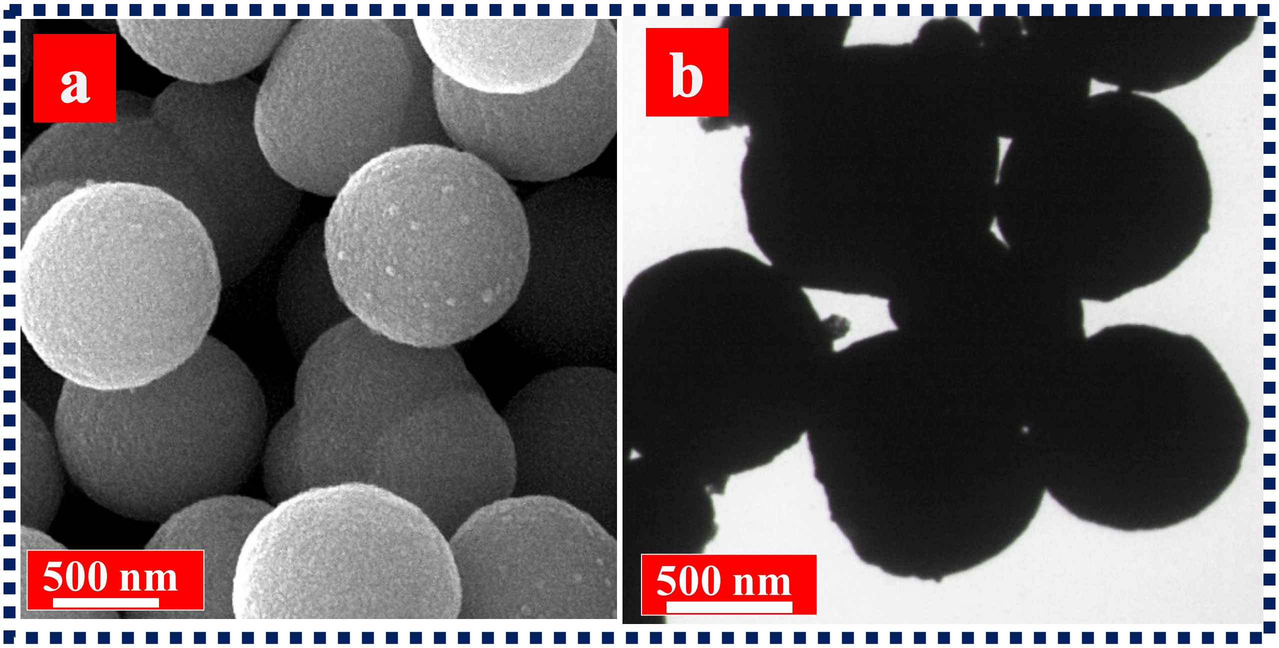

Fig. S4. *FE-SEM and TEM images of Ni-Fe precursor*

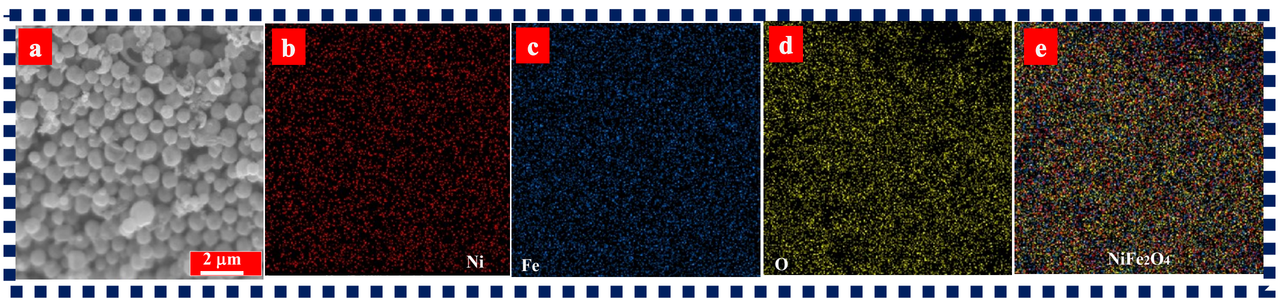

Fig. S5. *Elemental mapping image of YS-NFOHS sample*

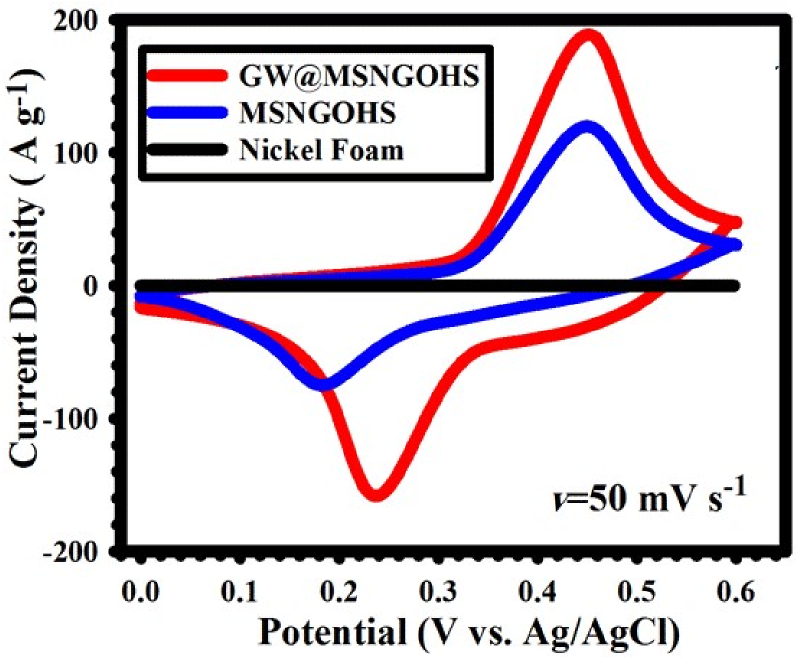

Fig. S6. *CV plots of GW-MSNGOHS, MSNGOHS and bare nickel foam electrodes*

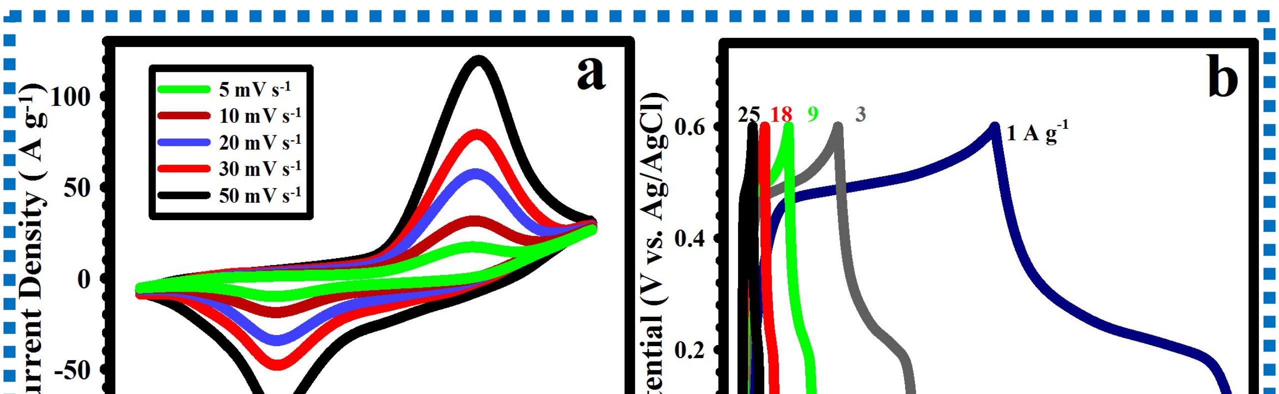

Fig. S7. *(a) CV plots of MSNGOHS electrode at different scan rates. (b) GCD plots of MSNGOHS electrode at various current densities.*

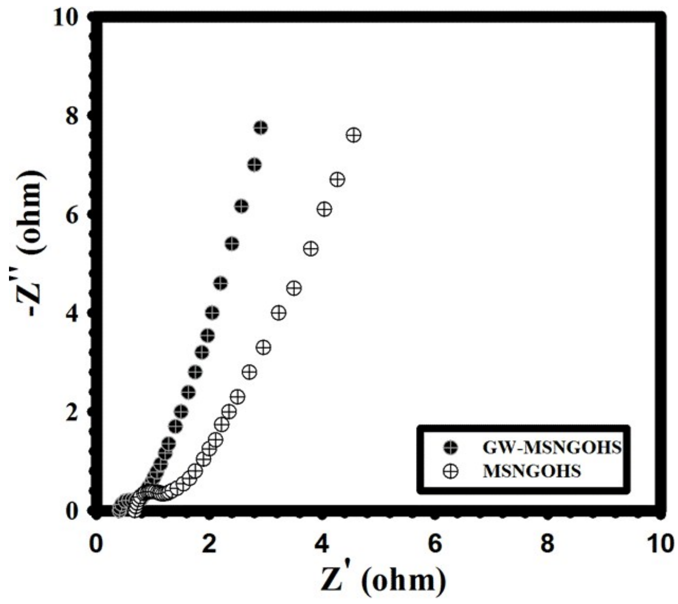

Fig. S8. *Nyquist plots of GW-MSNGOHS and MSNGOHS electrodes.*

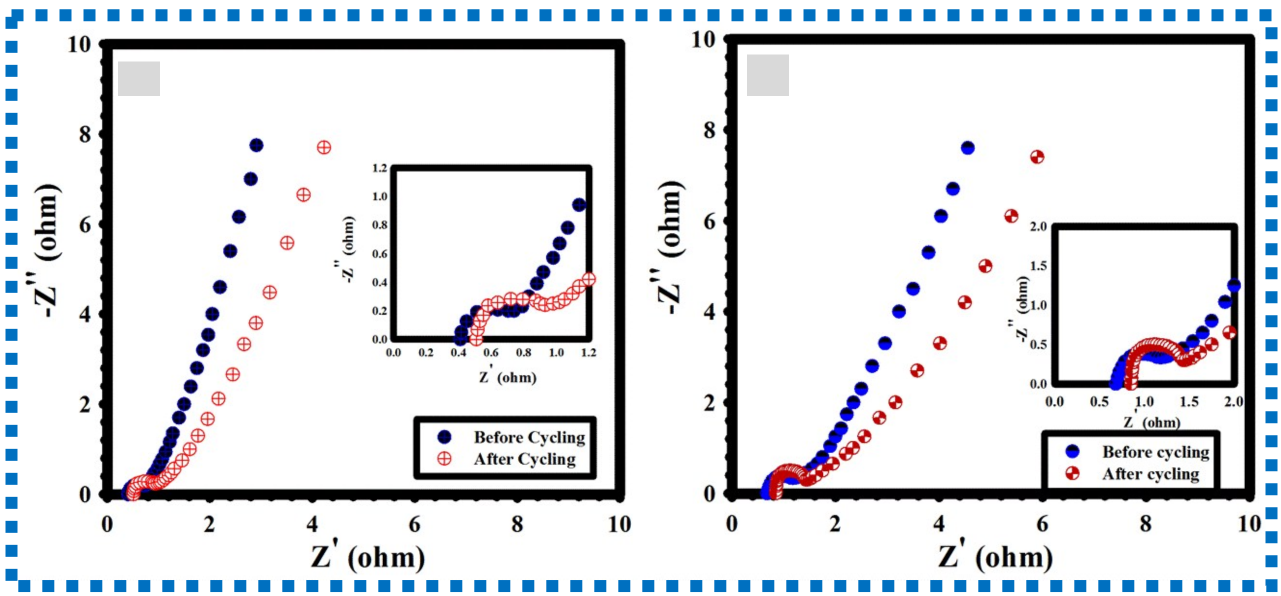

Fig. S9. *(a) Nyquist plots of GW-MSNGOHS electrode before and after cycling (b) Nyquist plots of MSNGOHS electrode before and after cycling*

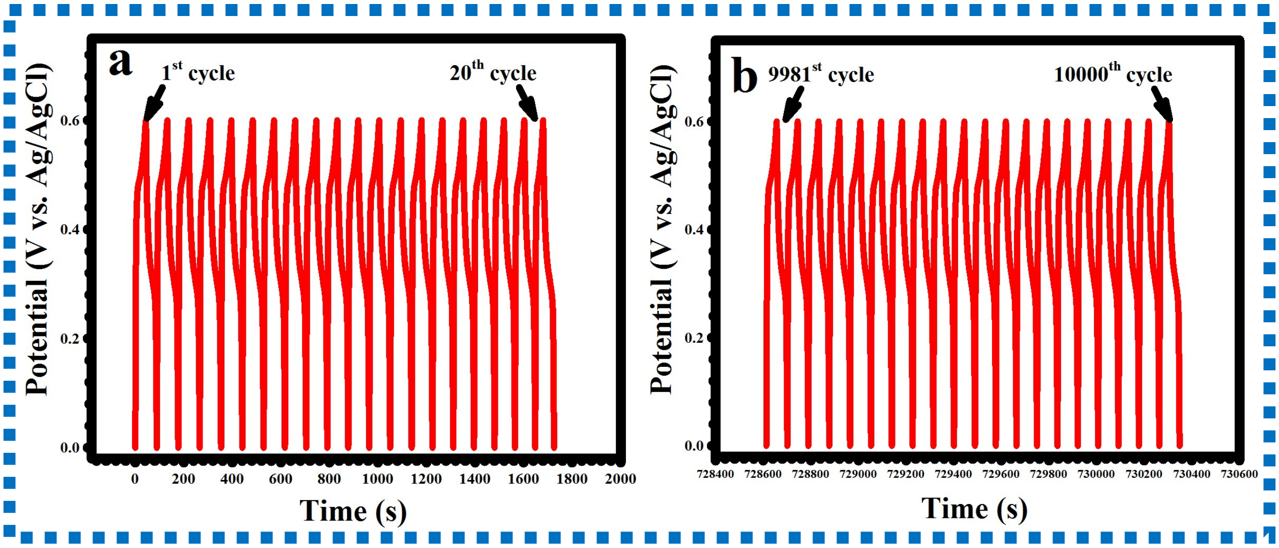

Fig. S10. *(a and b) GCD curves of GW-MSNGOHS electrode: first and last 20 cycles test.*

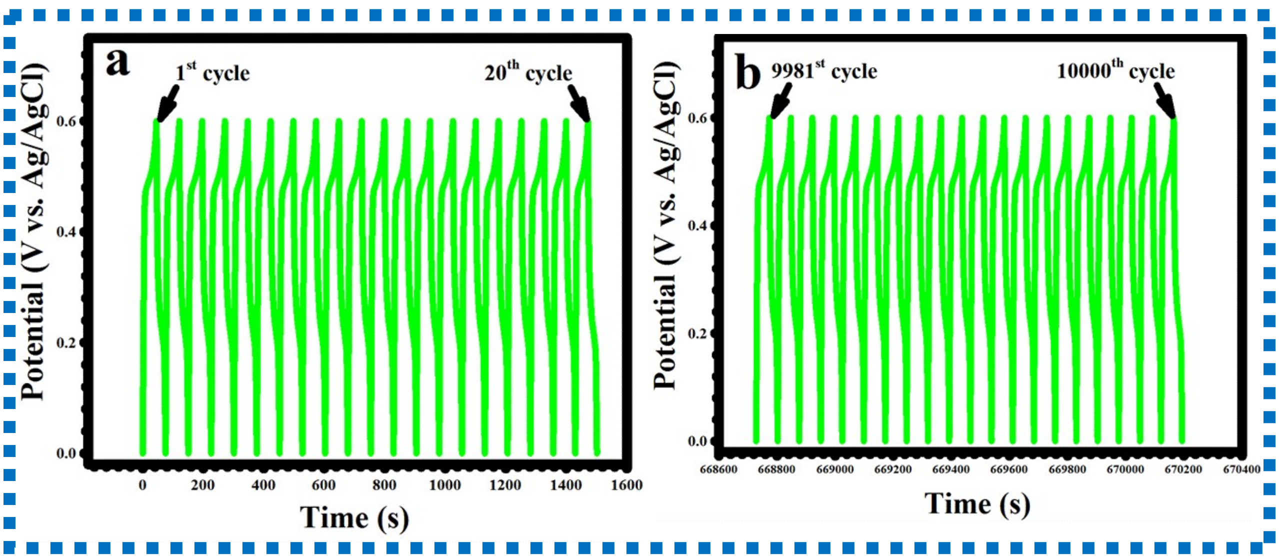

Fig. S11. *(a and b) GCD curves of MSNGOHS electrode: first and last 20 cycles test.*

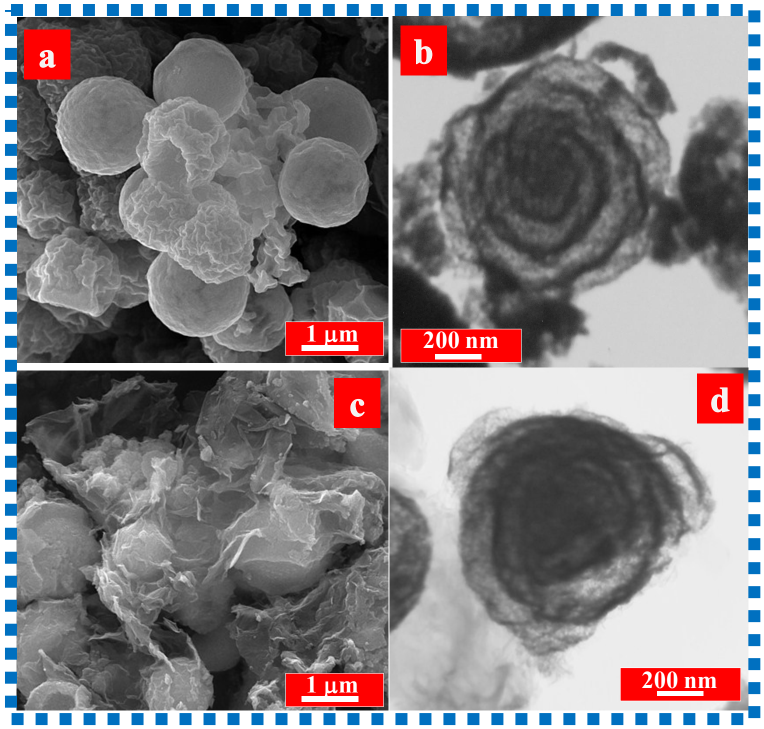

Fig. S12. *(a) FE-SEM image of the MSNGOHS electrode after 10000 cycles. (b) TEM image of the MSNGOHS electrode after 10000 cycles. (c) FE-SEM image of the GW-MSNGOHS electrode after 10000 cycles. (d) TEM image of the GW-MSNGOHS electrode after 10000 cycles.*

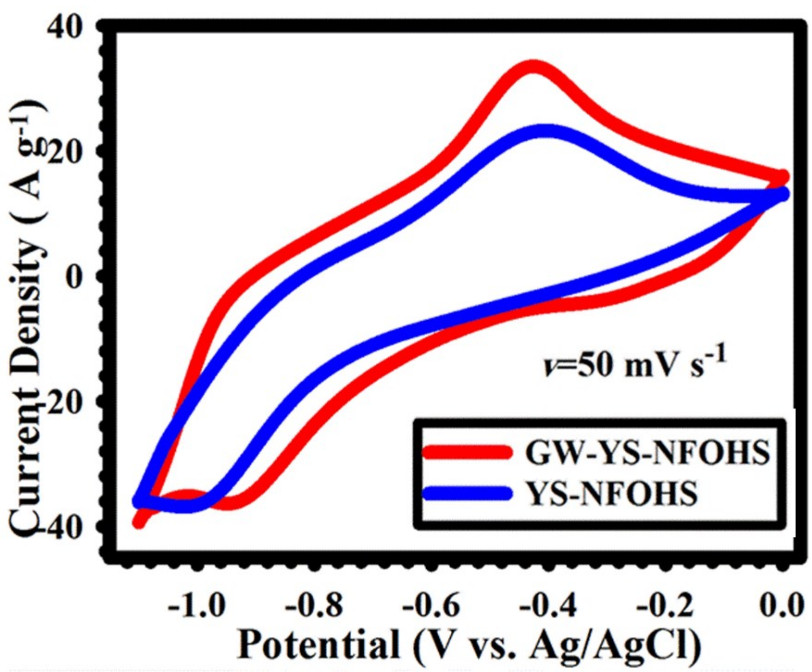

Fig. S13. *CV plots of GW-YSNFOHS and YS-NFOHS electrodes*

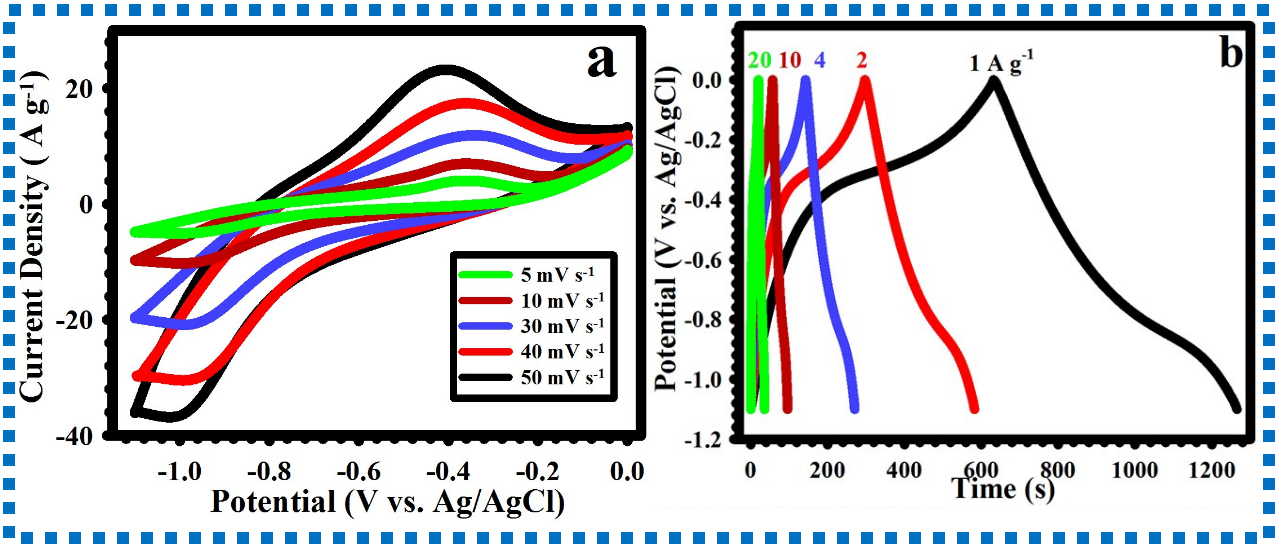

Fig. S14. *(a) CV plots of YS-NFOHS electrode at different scan rates. (b) GCD plots of YS-NFOHS electrode at various current densities.*

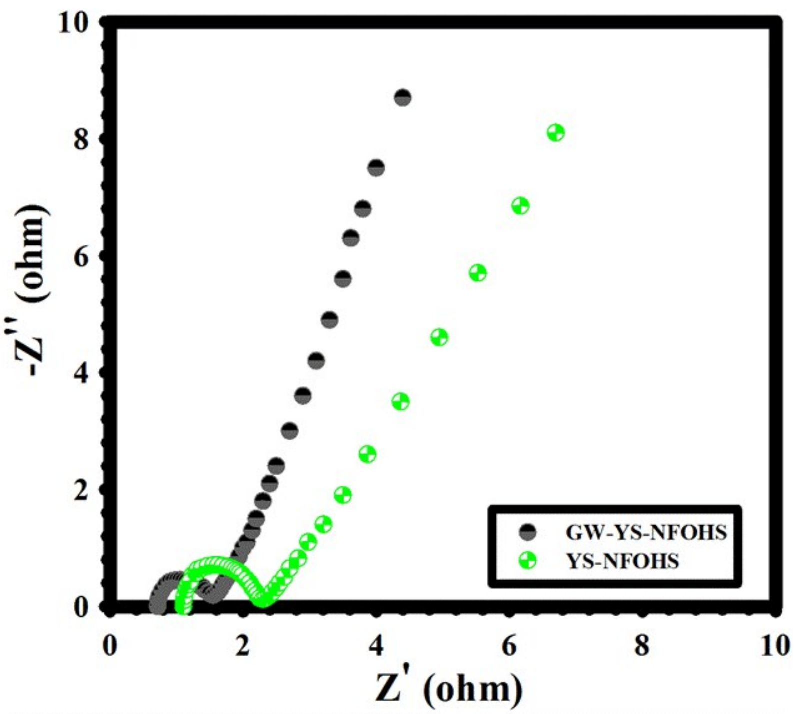

Fig. S15. *Nyquist plots of GW-YS-NFOHS and YS-NFOHS electrodes.*

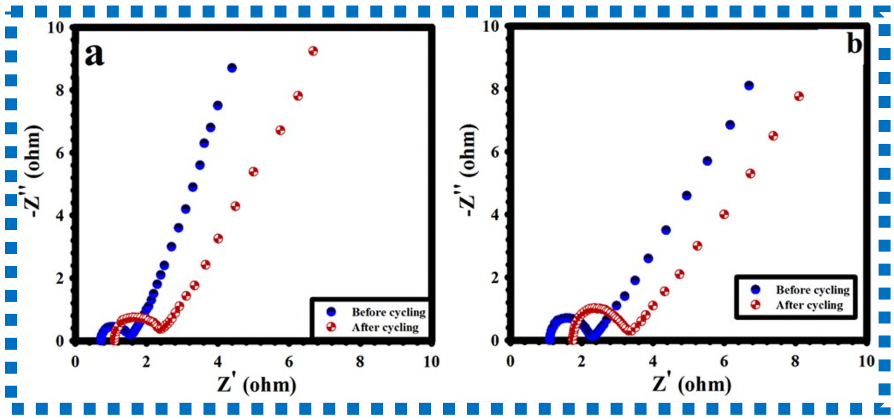

Fig. S16. *(a) Nyquist plots of GW-MSNGOHS electrode before and after cycling (b) Nyquist plots of MSNGOHS electrode before and after cycling.*

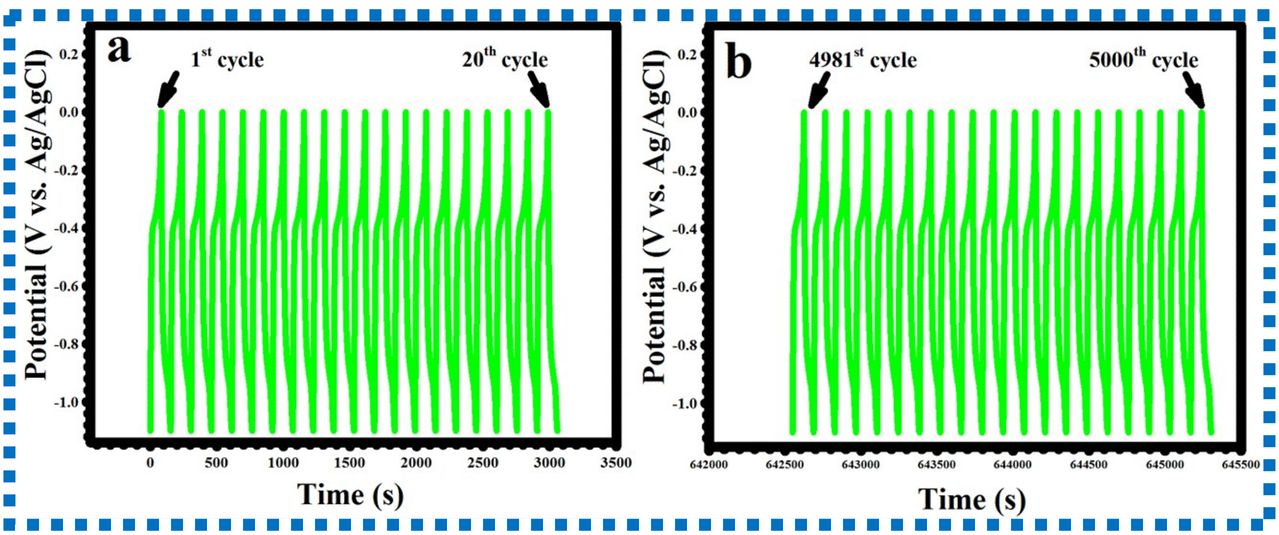

Fig. S17. *(a and b) GCD curves of GW-YS-NFOHS electrode: first and last 20 cycles test.*

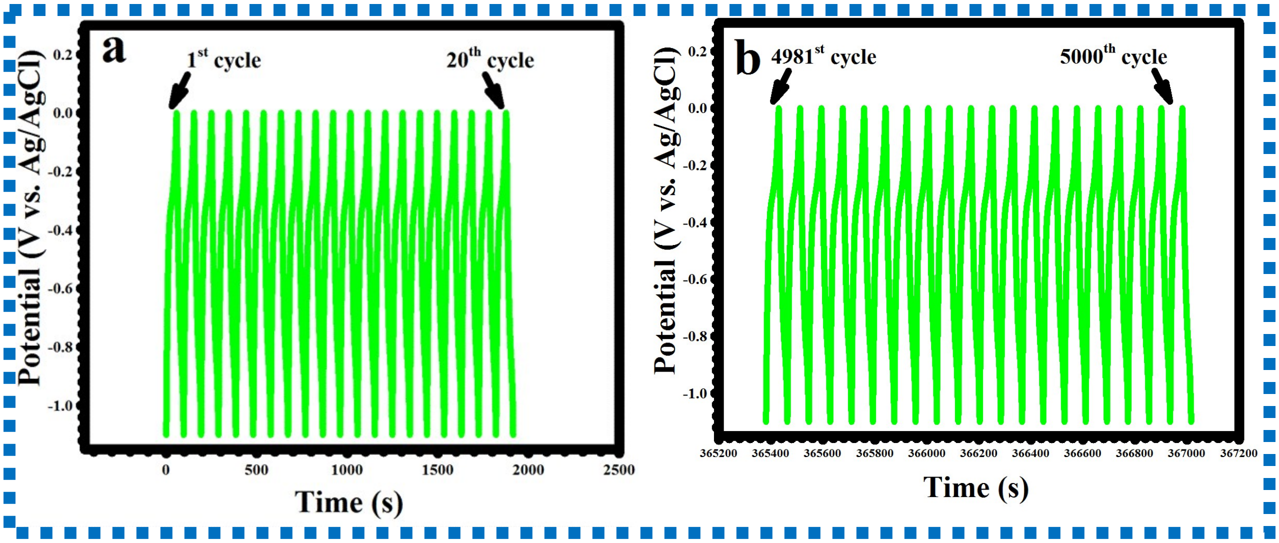

Fig. S18. *(a and b) GCD curves of GW-YS-NFOHS electrode: first and last 20 cycles test.*

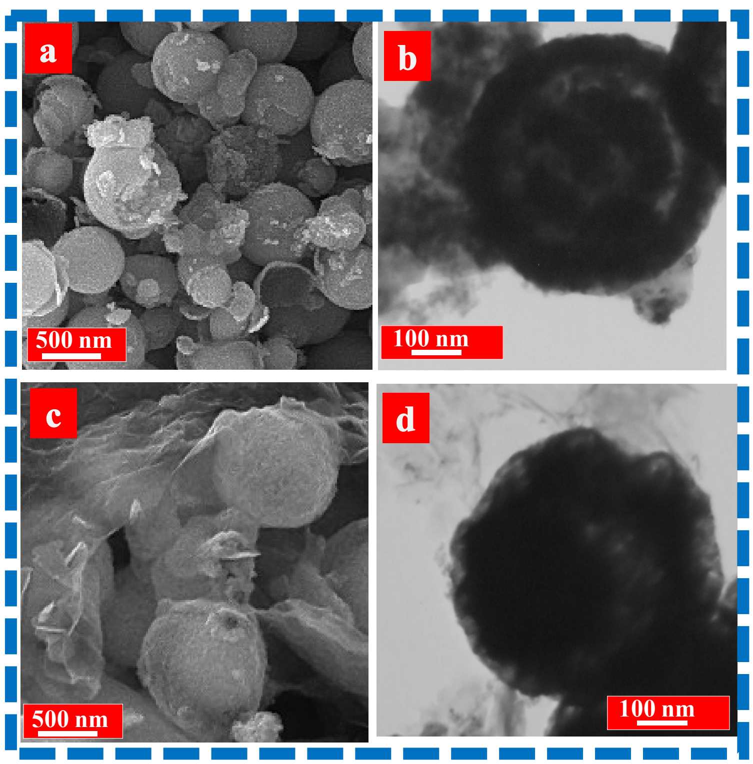

Fig. S19. *(a) FE-SEM image of the YS-NFOHS electrode after 10000 cycles. (b) TEM image of the YS-NFOHS electrode after 10000 cycles. (c) FE-SEM image of the GW-YS-NFOHS electrode after 10000 cycles. (d) TEM image of the GW-YS-NFOHS electrode after 10000 cycles.*

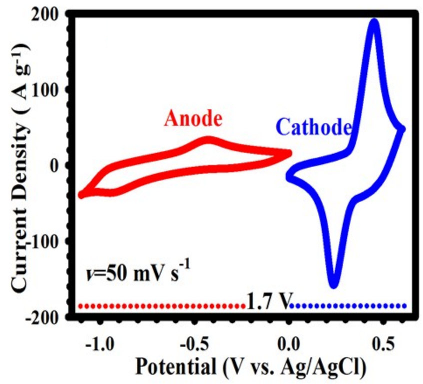

Fig. S20. *CV plots of GW-MSNGOHS (positive) and GW-YS-NFOHS (negative) electrodes at a scan rate of 50 mV s^{-1}.*

Table S1. *Comparison of the electrochemical performance of GW-MSNGOHS electrode in three and two electrode systems with other previously reported electrodes.*

Composition	Capacity 3 and 2 electrodes (mAh g^{-1})	Cycles, retention 2 and 3 electrode	ED (W h kg^{-1}) 2 Electrode	Reference
$MnCo_2O_{4.5}$@$Ni(OH)_2$	318 at 3 A g^{-1} (3 E) 70.67 at 1 A g^{-1} (2 E)	5000, 87.7% (3 E 3000, 90.4% (2 E)	56.53	1
Co_3O_4	209 at 1 A g^{-1} (3 E)	3000, 90 (3 E)	41.4	2
$NiCo_2O_4$	130 at .63 A g^{-1} (3 E)	100, 100 (3 E)	16.6	3
NiO	119.7 at 2 A g^{-1}(3 E) 28.3 at 2 A g^{-1} (2 E)	5000, 84.2% (3 E) 5000, 85.2% (2 E)	48	4
$ZnCo_2O_4$	78.89 at 1 A g^{-1} (3 E) 34.7 at .2 A g^{-1} (2 E)		27.78	5
$Co_3O_4/Co(OH)_2$	184.9 at 1 A g^{-1} (3 E) 58.9 at 4 A g^{-1} (2 E)	5000, 90% (3 E) 5000, 91% (2 E)	37.6	6
$NiCo_2S_4$@$Ni(OH)_2$	404.2 at 2 A g^{-1} (3 E)	5000, 90% (3 E) 6000, 97% (2 E)	83	7

GW-MSNGOHS	**411.25 at 1 A g^{-1} (3 E)** **140.2 at 1 A g^{-1} (2 E)**	**10000, 98.9 (3 E)** **10000, 92.1 (2 E)**	**118.97**	**This work**

References

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