Supporting Information

Ammonium ion pre-intercalated MnO_2 on carbon cloth for high energy density asymmetric supercapacitor

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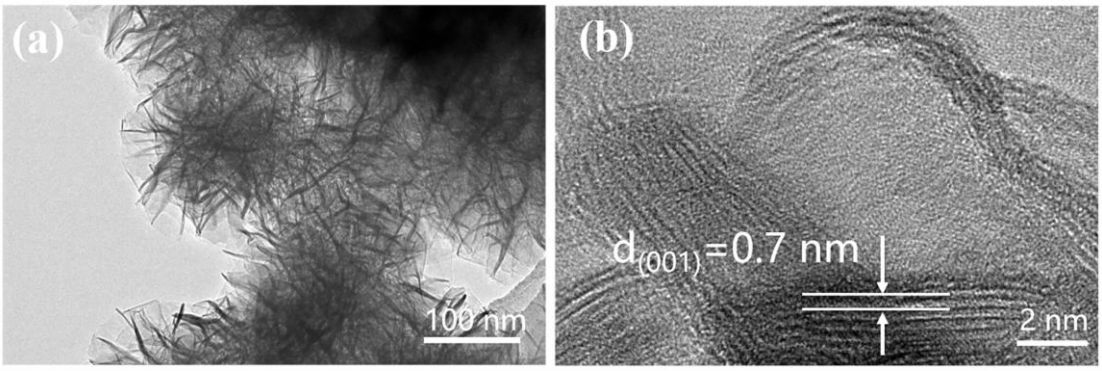

Figure S1. (a) TEM image of CC@NMO, (b) HRTEM image of CC@NMO.

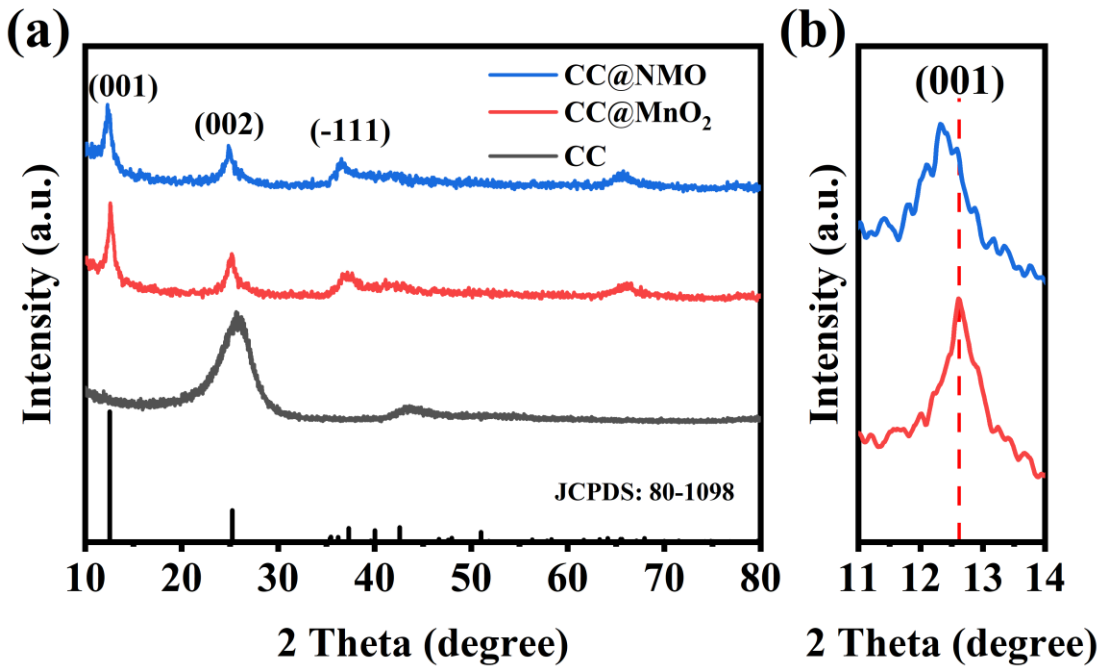

Figure S2. XRD patterns of CC@NMO, CC@MnO_2 and CC.

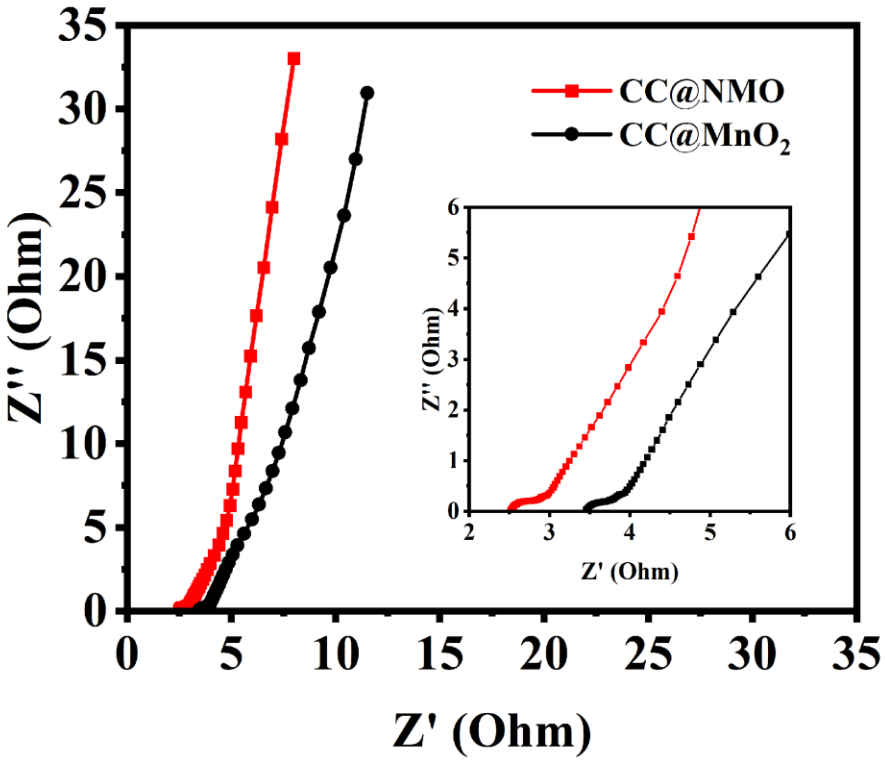

Figure S3. EIS curves of CC@NMO and CC@MnO_2.

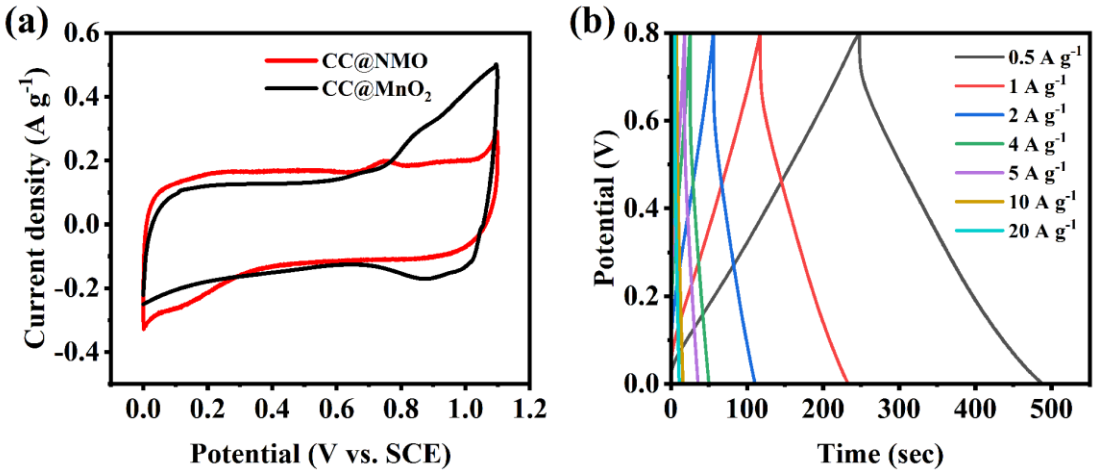

Figure S4. (a) comparison of CC@NMO and CC@MnO_2 at 1 mV s^{-1} at 0-1.1 V, (b) GCD curves of CC@MnO_2 at 0-0.8 V at different current densities.

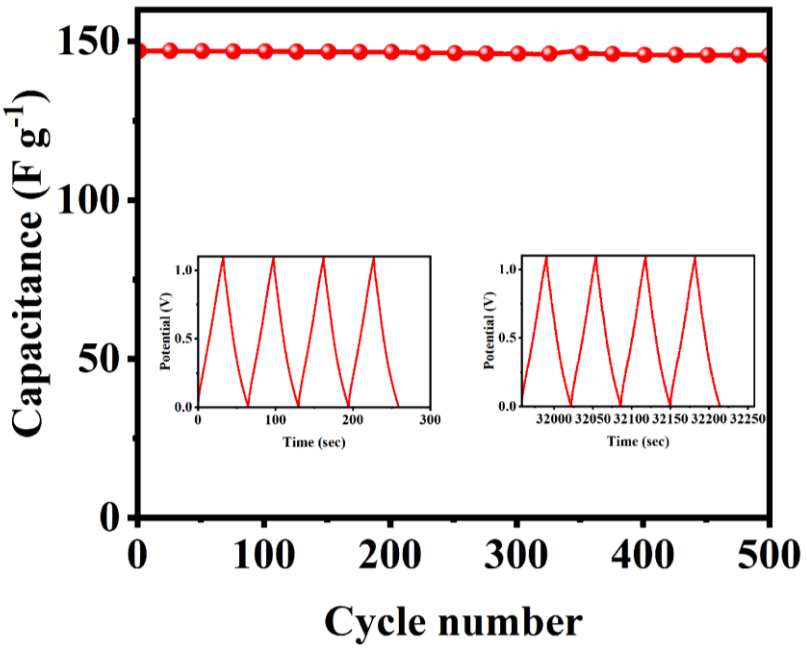

Figure S5. cycle stability of CC@NMO at 5 A g^{-1}.

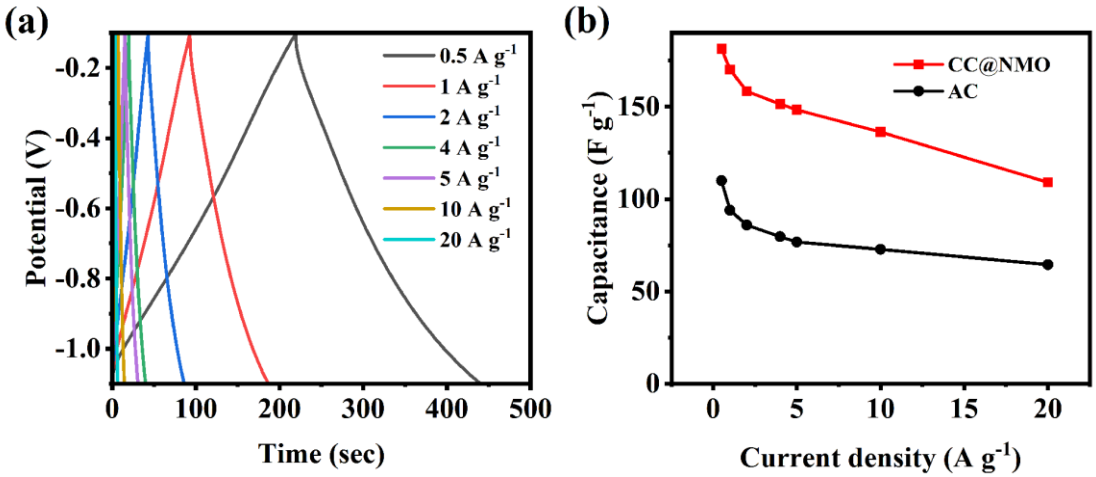

Figure S6. (a) GCD curves of AC at -0.1 to -1.1 V at different current densities, (b) Capacitance of CC@NMO and AC at different current densities.

Table S1. Comparison of energy density and power density with other recent studies.

Sample	Energy density (Wh/kg)	Power density (W/kg)	References
CC@NMO	**63.49**	**949.8**	**This work**
MnO_2@PCN//PCN	31.13	193.6	[42]
N/P-HCS@MnO_2-30	32.21	449.8	[43]
G/MnO_2	19.6	351	[44]
MnO_2@SnO_2//AC	18.05	403.6	[45]
MnO_2@N-APC//N-APC	28	506	[46]
AC//MnO_2@NH_4MnF_3	11.2	1000	[47]
MnO_2/SHAC-3//SHAC	48.2	98.5	[48]
Co-Ni LDH/MC973	37	750	[49]
Ni-Co LDH-3	21.28	500	[50]
NCNS–NCW	56.1	349	[51]

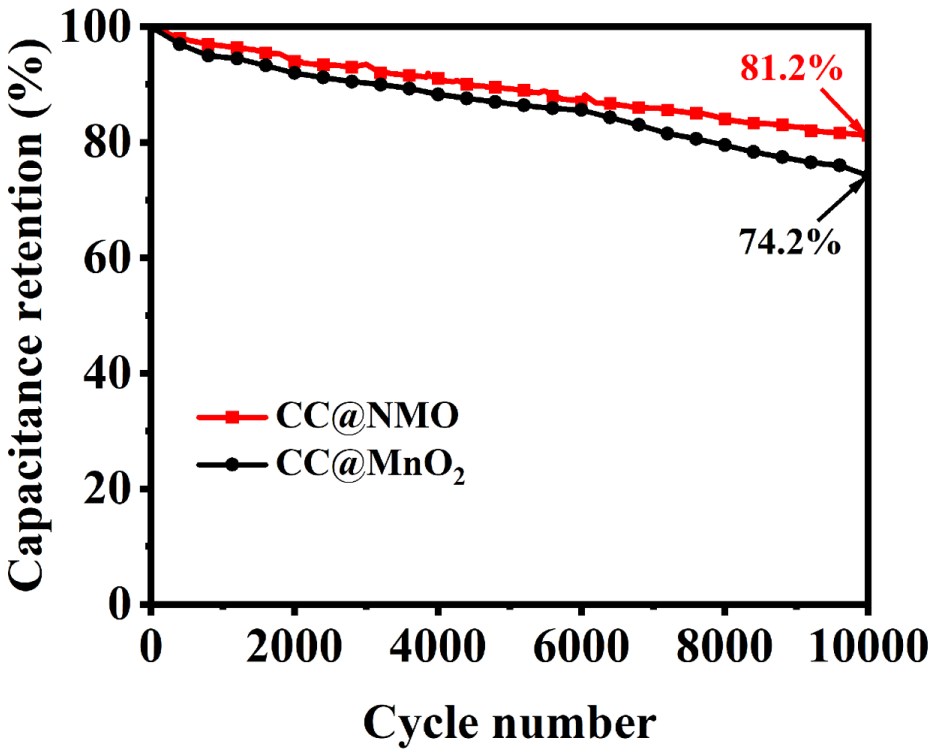

Figure S7. Comparison of cycle stability of CC@NMO//AC and CC@MnO_2//AC.

References

42. Feng, W.C.; Liu, G.; Wang, P.P.; Zhou, J.W.; Gu, L.X.; Chen, L.Z.; Li, X.Y.; Dan, Y.Y.; Cheng, X.F. Template Synthesis of a Heterostructured MnO_2@SnO_2 Hollow Sphere Composite for High Asymmetric Supercapacitor Performance. *ACS Appl. Energy Mater.* **2020**, *3*, 7284-7293, doi:10.1021/acsaem.0c00388.
43. Li, B.; Zhang, X.H.; Dou, J.H.; Zhang, P.X. Construction of MnO_2@NH_4MnF_3 core-shell nanorods for asymmetric supercapacitor. *Electrochim. Acta* **2020**, *347*, doi:10.1016/j.electacta.2020.136257.
44. Li, D.Y.; Lin, J.; Lu, Y.; Huang, Y.; He, X.; Yu, C.; Zhang, J.; Tang, C.C. MnO_2 nanosheets grown on N-doped agaric-derived three-dimensional porous carbon for asymmetric supercapacitors. *J. Alloys Compd.* **2020**, *815*, doi:10.1016/j.jallcom.2019.152344.
45. Tan, Y.L.; Yang, C.X.; Qian, W.W.; Teng, C. Flower-like MnO_2 on layered carbon derived from sisal hemp for asymmetric supercapacitor with enhanced energy density. *J. Alloys Compd.* **2020**, *826*, doi:10.1016/j.jallcom.2020.154133.
46. Wu, P.C.; Gao, M.; Yu, S.C.; Feng, M.L.; Liu, S.H.; Fu, J.W. MnO_2 nanosheets grown on N and P co-doped hollow carbon microspheres for high performance asymmetric supercapacitor. *Electrochim. Acta* **2020**, *354*, doi:10.1016/j.electacta.2020.136681.
47. Yang, Y.K.; Niu, H.; Qin, F.F.; Guo, Z.Y.; Wang, J.S.; Ni, G.S.; Zuo, P.P.; Qu, S.J.; Shen, W.Z. MnO_2 doped carbon nanosheets prepared from coal tar pitch for advanced asymmetric supercapacitor. *Electrochim. Acta* **2020**, *354*, doi:10.1016/j.electacta.2020.136667.
48. Zhang, M.; Zheng, H.; Zhu, H.L.; Xu, Z.F.; Liu, R.; Chen, J.L.; Song, Q.; Song, X.J.; Wu, J.; Zhang, C.Z.; et al. Graphene-wrapped MnO_2 achieved by ultrasonic-assisted synthesis applicable for hybrid high-energy supercapacitors. *Vacuum* **2020**, *176*, doi:10.1016/j.vacuum.2020.109315.
49. Wang, M.; Feng, Y.; Zhang, Y.; Li, S.S.; Wu, M.M.; Xue, L.L.; Zhao, J.H.; Zhang, W.; Ge, M.Z.; Lai, Y.K.; et al. Ion regulation of hollow nickel cobalt layered double hydroxide nanocages derived from ZIF-67 for High-Performance supercapacitors. *Appl. Surf. Sci.* **2022**, *596*, doi:10.1016/j.apsusc.2022.153582.
50. Yang, J.J.; Li, H.L.; He, S.J.; Du, H.J.; Liu, K.M.; Zhang, C.M.; Jiang, S.H. Facile Electrodeposition of $NiCo_2O_4$ Nanosheets on Porous Carbonized Wood for Wood-Derived Asymmetric Supercapacitors. *Polymers* **2022**, *14*, doi:10.3390/polym14132521.
51. Yao, Y.S.; Li, H.J.; Yu, Y.; Du, C.; Wan, L.; Ye, H.; Chen, J.; Zhang, Y.; Xie, M.J. Stabilizing microstructure of Co-Ni layered double hydroxides by magnesium doping and confinement in carbonaceous mesopores for ultrahighly-stable asymmetric supercapacitor. *J. Energy Storage* **2023**, *59*, doi:10.1016/j.est.2022.106422.