Supporting Information

Hierarchical CoO/$MnCo_2O_{4.5}$ Nanorod Arrays on Flexible Carbon Cloth as High-Performance Anode Materials for Lithium-ion Batteries

Lianshan Ni,[a] Wei Tang,[a] Xiaohe Liu,*[a] Ning Zhang,[a] Jun Wang,[b] Shuquan Liang,[a] Renzhi Ma,*[c] Guanzhou Qiu[b]

[a] *State Key Laboratory of Powder Metallurgy and School of Materials Science and Engineering, Central South University, Changsha, Hunan 410083, P. R. China*

[b] *School of Resources Processing and Bioengineering, Central South University, Changsha, Hunan 410083, P. R. China*

[c] *International Center for Materials Nanoarchitectonics (MANA), National Institute for Materials Science (NIMS), Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan.*

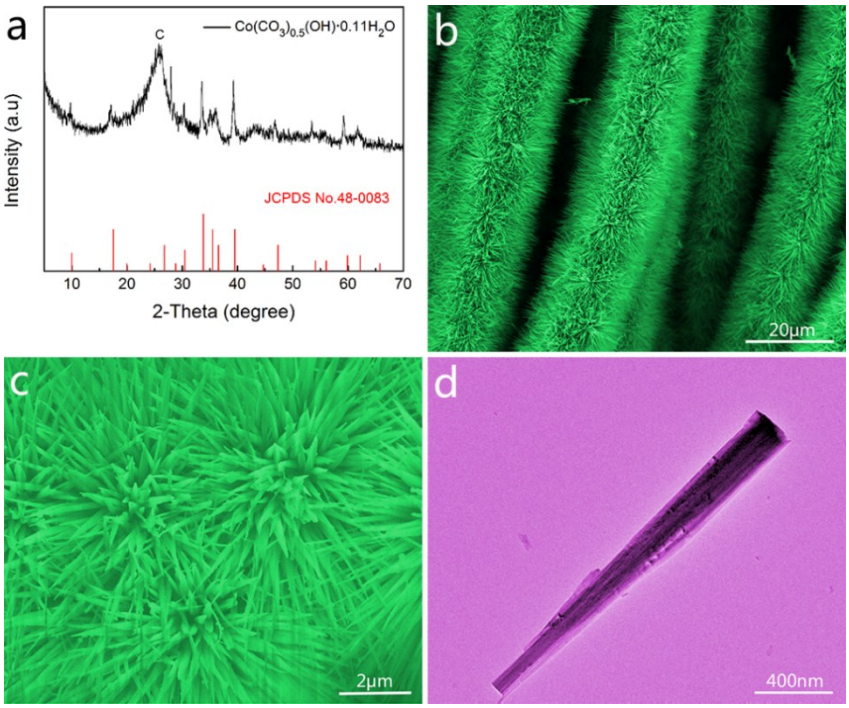

Figure S1. (a) XRD pattern, (b, c) SEM and TEM images of as-prepared $Co(CO_3)_{0.5}(OH)\cdot 0.11H_2O$ nanorods grown on the CC.

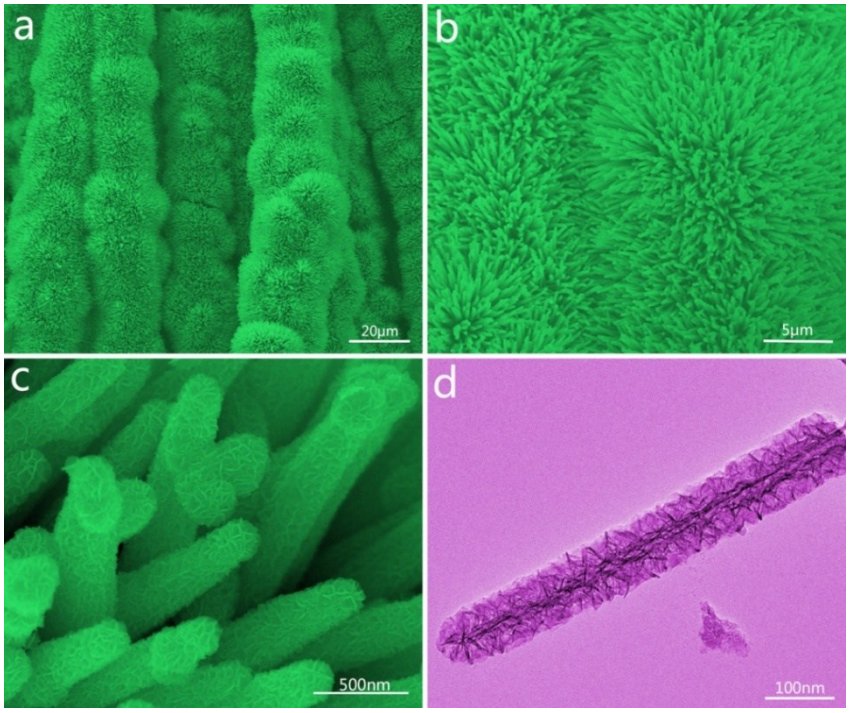

Figure S2. (a, b, c) SEM and (d) TEM images of the precursor grown on the CC.

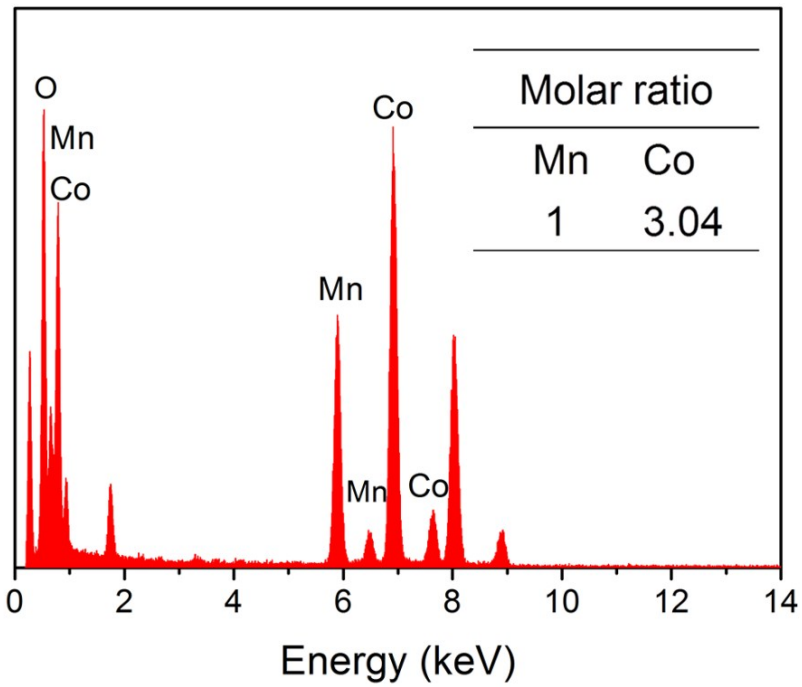

Figure S3. EDX spectroscopy of the hierarchical CoO/$MnCo_2O_{4.5}$ nanorods grown on CC. Inset depicts the molar ratios of metal ions determined by ICP.

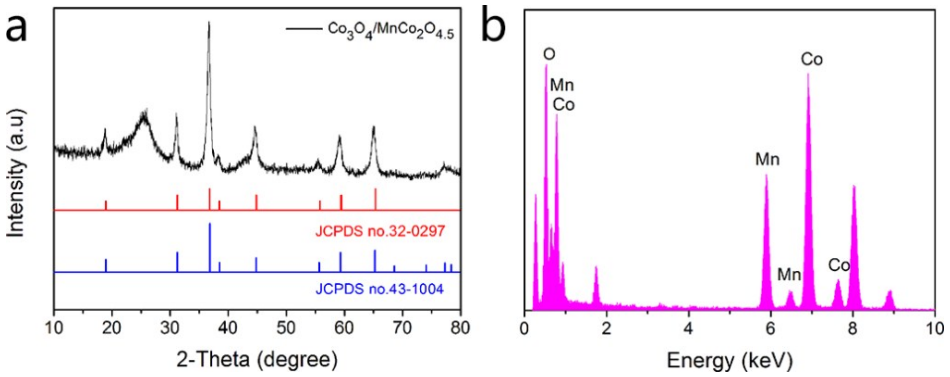

Figure S4. (a) XRD pattern and (b) EDX spectroscopy of the hierarchical $Co_3O_4/MnCo_2O_{4.5}$ nanorods grown on CC.

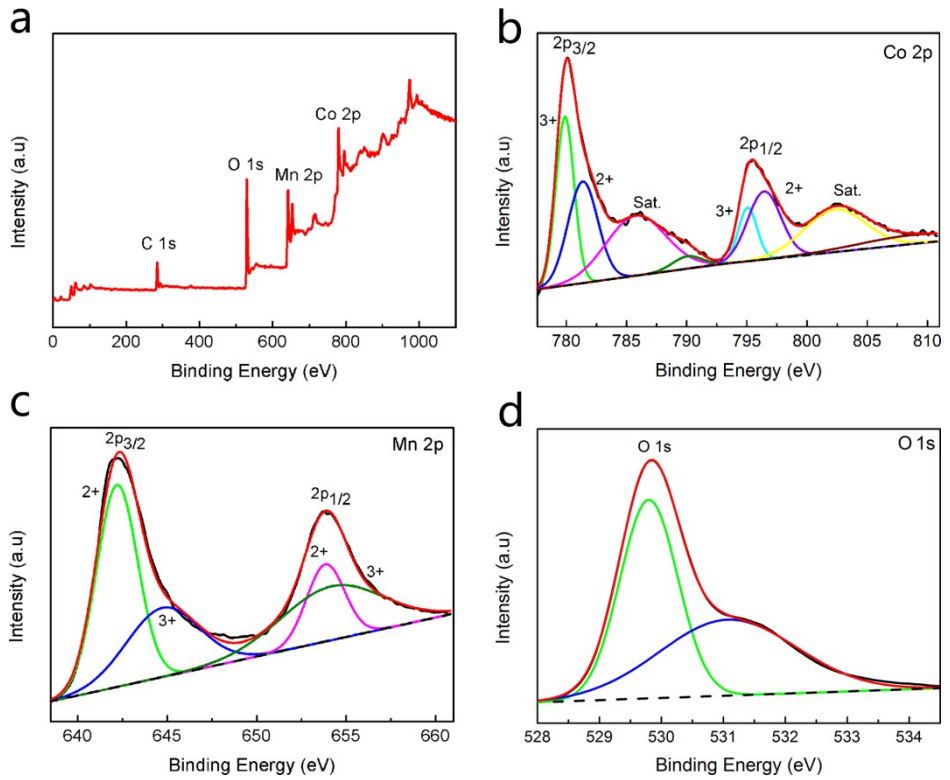

Figure S5. XPS spectra of as-prepared $Co_3O_4/MnCo_2O_{4.5}$ product: (a) survey spectrum, (b) Co 2p, (c) Mn 2p and (d) O1s.

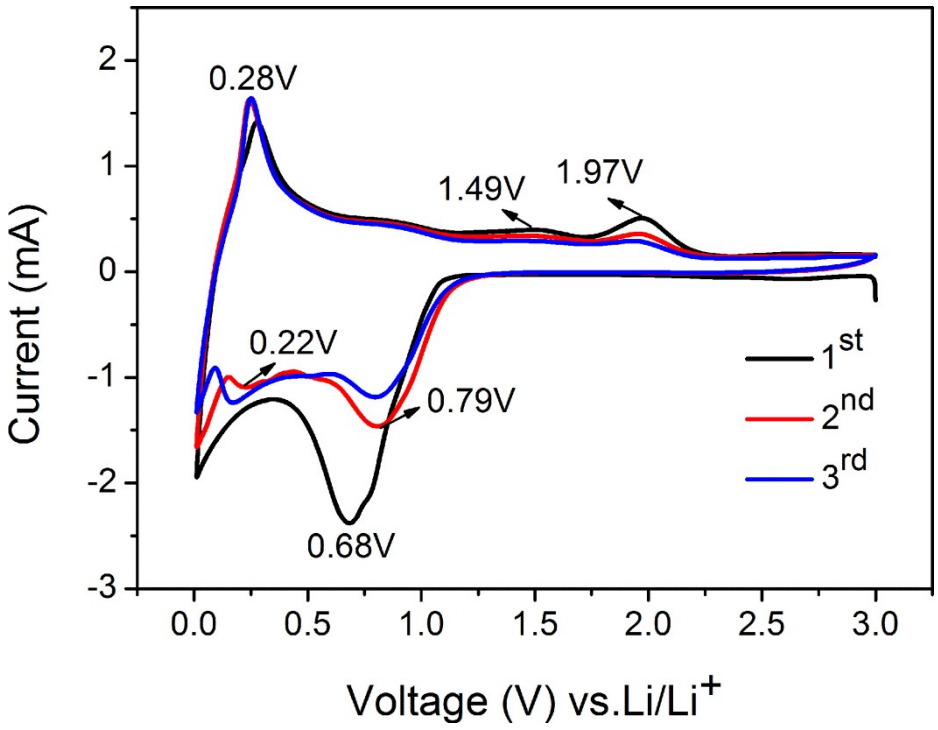

Figure S6. Cyclic voltammetry curves of the $Co_3O_4/MnCo_2O_{4.5}$ electrode in a voltage range of 0.01-3.0 V at a scanning rate of 0.1 mV s^{-1}.

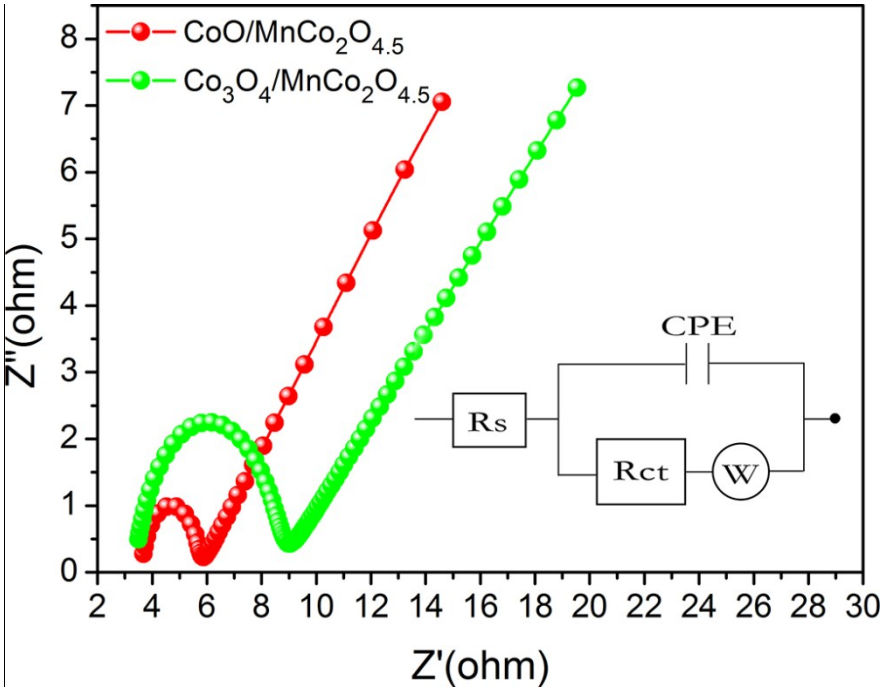

Figure S7. EIS plots of as-prepared $CoO/MnCo_2O_{4.5}$ and $Co_3O_4/MnCo_2O_{4.5}$ electrodes before test in the frequency range between 0.01 Hz and 100 kHz (inset shows the equivalent circuit diagram).

Table S1. Corresponding parameters that obtained from the Nyquist plots.

electrode	Rs(Ω)	CPE1-T	CPE1-P	Rct(Ω)	W1-R	W1-T	W1-P
$CoO/MnCo_2O_{4.5}$	3.623	$3.3025E^{-5}$	0.96295	2.075	41.01	257.1	0.43099
$Co_3O_4/MnCo_2O_{4.5}$	3.368	$2.587E^{-5}$	0.89026	5.253	48.79	520.9	0.37589