Supporting Information

Constructing Ni-Co PBA Derived 3D/1D/2D $NiO/NiCo_2O_4$/NiMn-LDH Hierarchical Heterostructure for Ultrahigh Rate Capability in Hybrid Supercapacitors

Dongyan Gao,[#a] Renning Liu,[#a] Dandan Han,*[a] Pengcheng Xu,[a] Ping Wang,[a] Yen Wei *[b]

[a] *College of Biology & Food Engineering, Jilin Institute of Chemical Technology, Jilin 132022, China*

[b] *Department of Chemistry and the Tsinghua Center for Frontier Polymer Research, Tsinghua University, Beijing, 100084, China*

[#] These authors contributed equally to this work.

*Corresponding author.

E-mail address: luckhan2006@163.com (D.D.H); weiyen@tsinghua.edu.cn (Y.W)

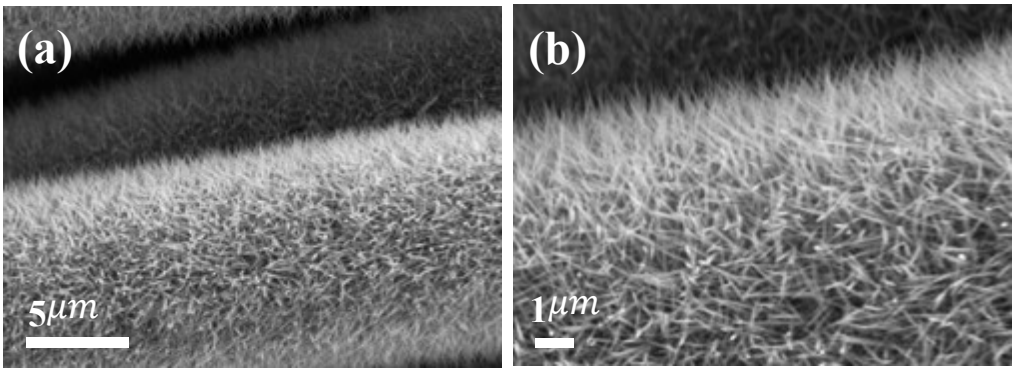

Figure S1. SEM images of (a, b) CC/$NiCo_2O_4$.

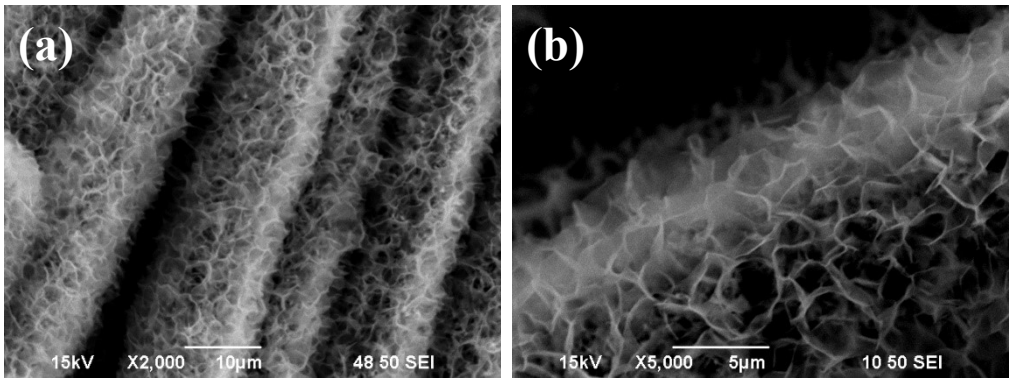

Figure S2. (a, b) SEM images of CC/NiMn-LDH-2.

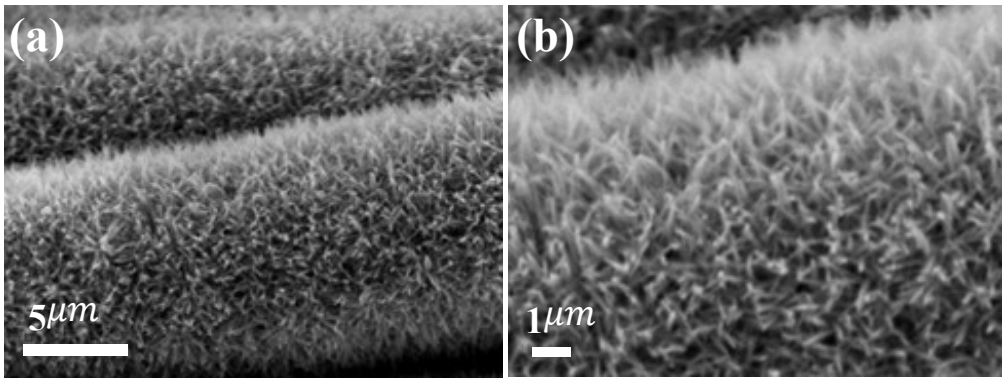

Figure S3. (a, b) SEM images of CC/NiO/$NiCo_2O_4$@NiMn-LDH-1.

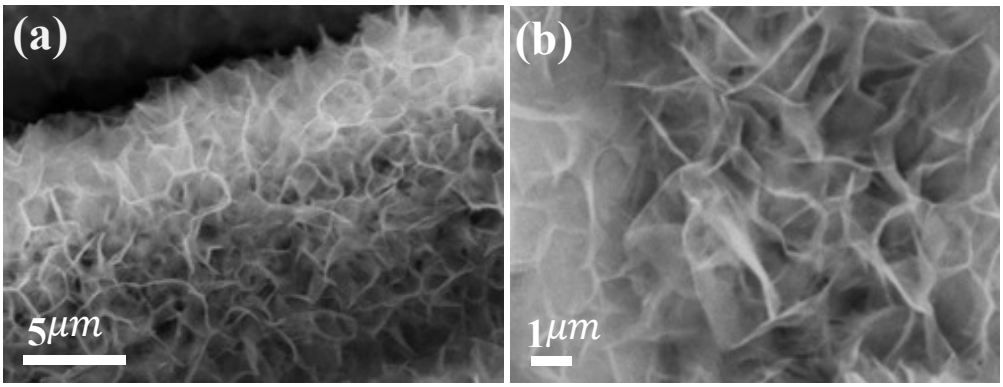

Figure S4 (a, b) SEM images of CC/NiO/$NiCo_2O_4$@NiMn-LDH-4.

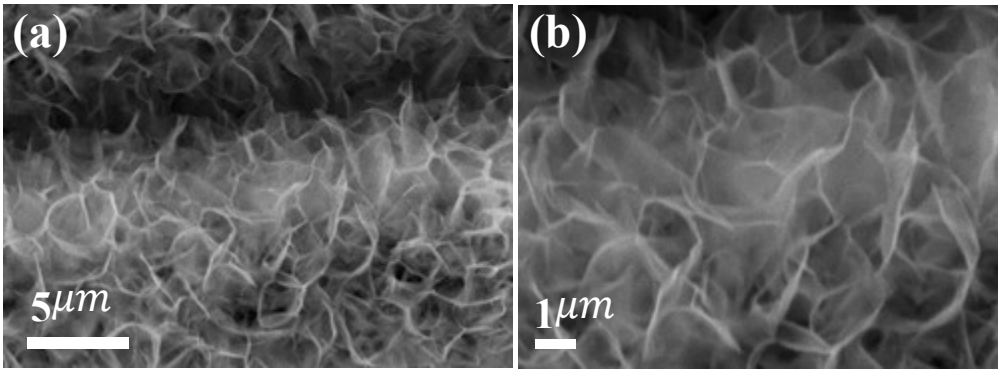

Figure S5. (a, b) SEM images of CC/NiO/$NiCo_2O_4$@NiMn-LDH-6

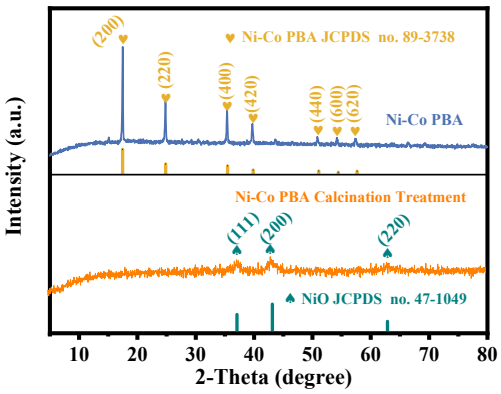

Figure S6 XRD patterns of the Ni-Co PBA and Ni-Co PBA was calcined at 350 ℃ in air atmosphere for 3 h with 2 ℃/min.

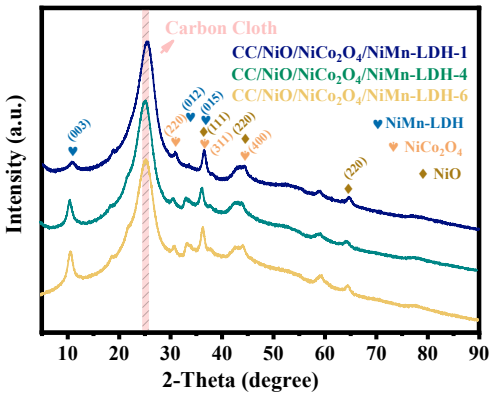

Figure S7. XRD of CC/NiO/$NiCo_2O_4$/NiMn-LDH-1, CC/NiO/$NiCo_2O_4$/NiMn-LDH-4 and CC/NiO/$NiCo_2O_4$/NiMn-LDH-6.

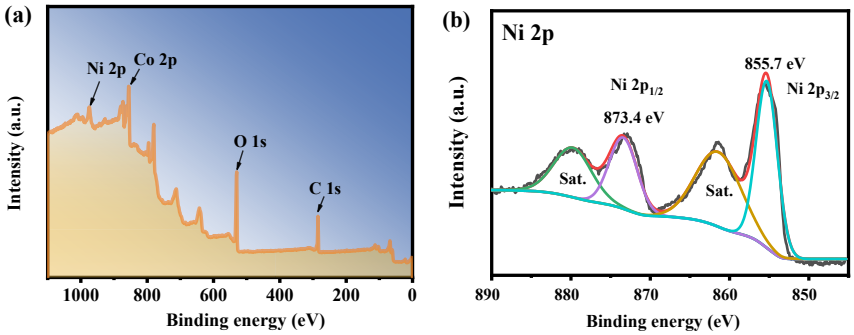

Figure S8. XPS spectra of (a) survey spectrum and (b) Ni 2p of CC/NiO/$NiCo_2O_4$

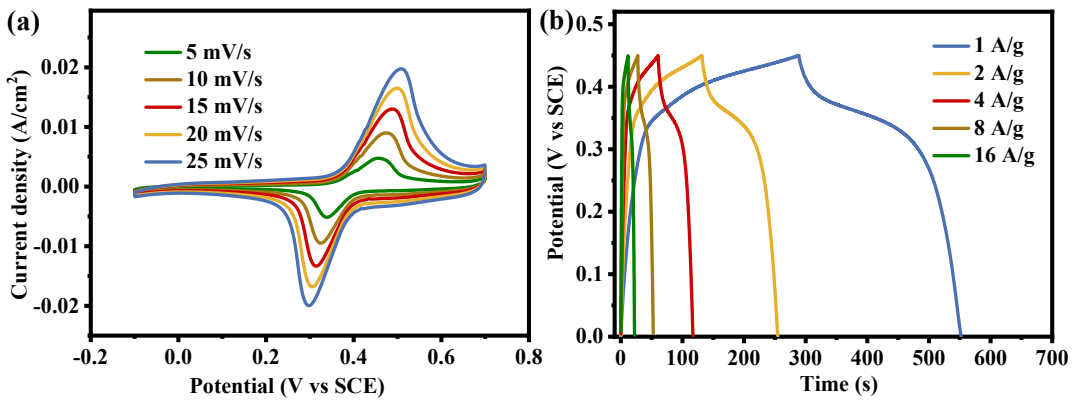

Figure S9. (a) CV curves and (b) GCD curves of CC/$NiCo_2O_4$ electrode

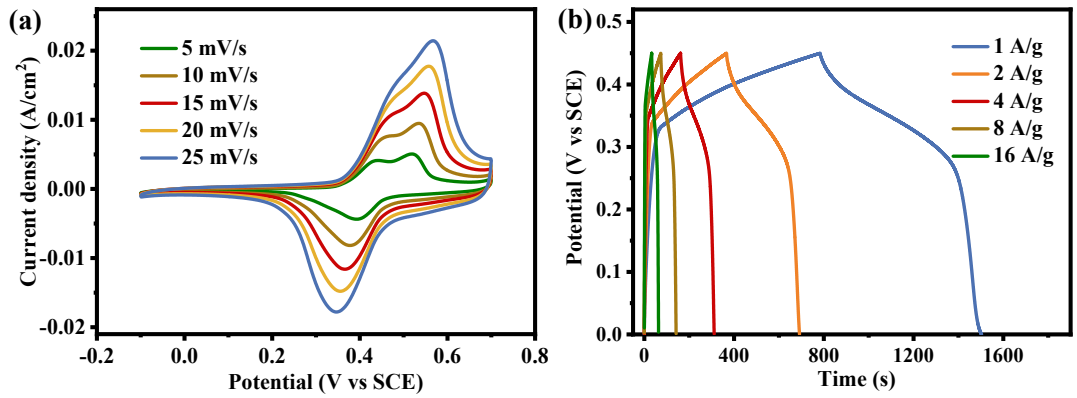

Figure S10. (a) CV curves and (b) GCD curves of CC/NiO/$NiCo_2O_4$ electrode.

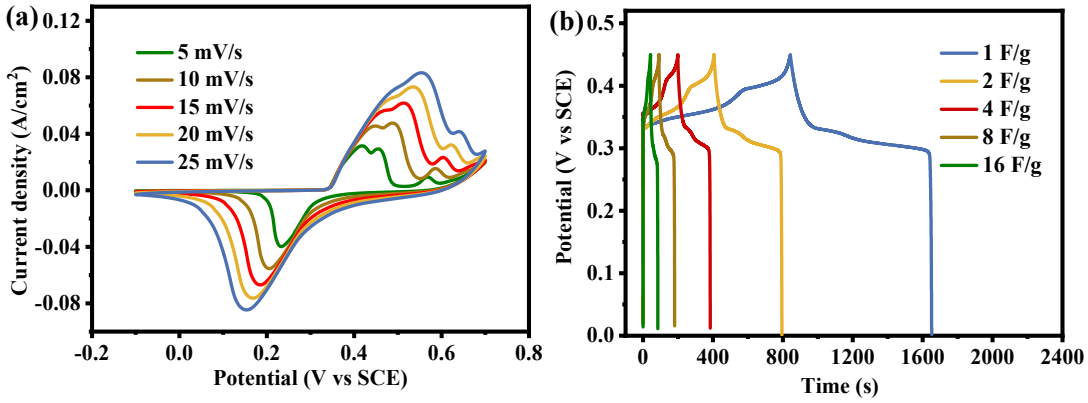

Figure S11. (a) CV curves and (b) GCD curves of CC/NiMn-LDH-2 electrode.

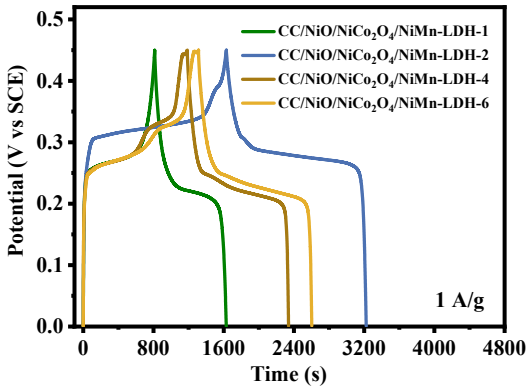

Figure S12. GCD curves of CC/NiO/$NiCo_2O_4$/NiMn-LDH-1, CC/NiO/$NiCo_2O_4$/NiMn-LDH-2, CC/NiO/$NiCo_2O_4$/NiMn-LDH-4, and CC/NiO/$NiCo_2O_4$/NiMn-LDH-6 at 1 $A \cdot g^{-1}$.

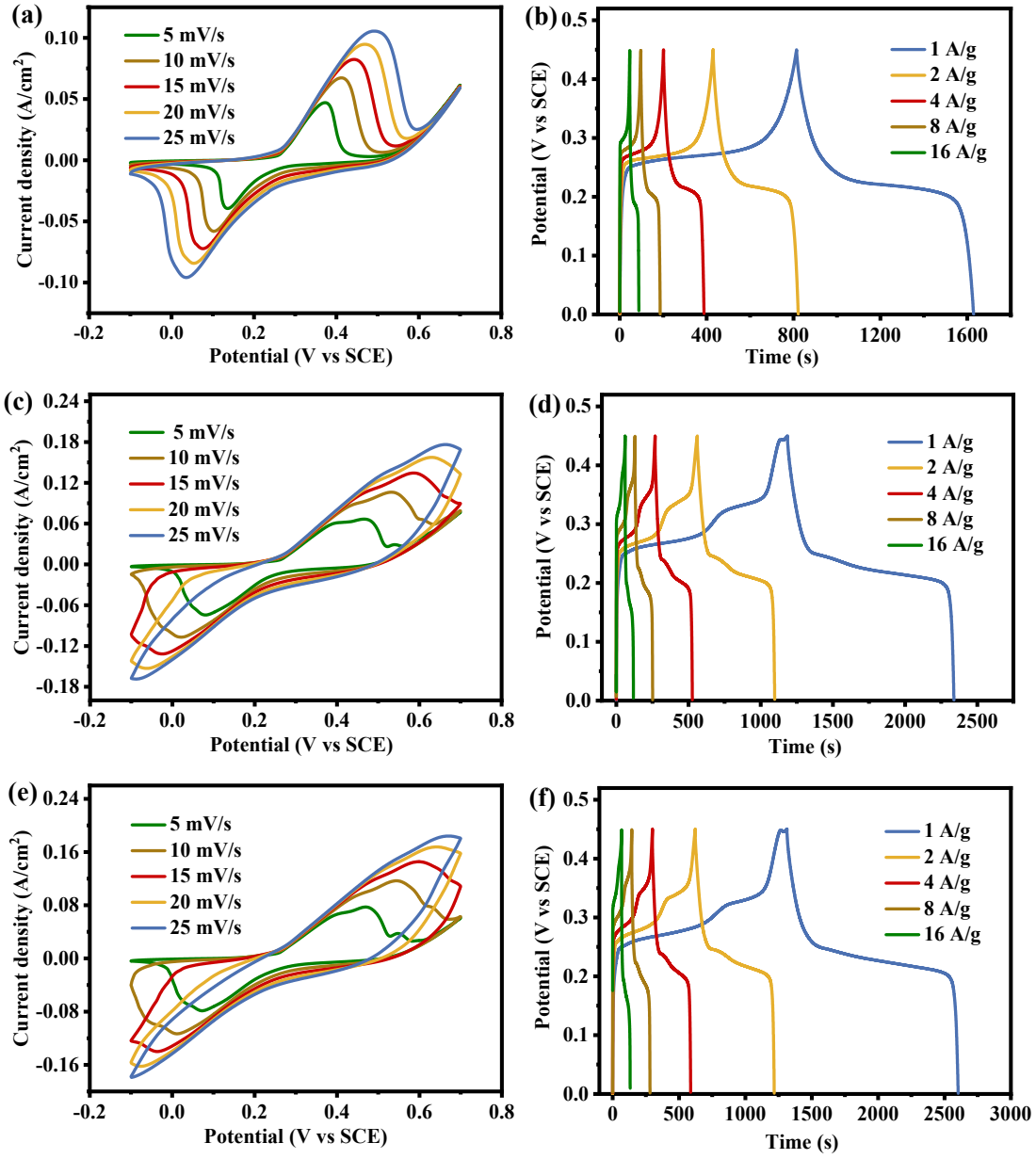

Figure S13. (a) CV and (b) GCD curves of CC/NiO/$NiCo_2O_4$/NiMn-LDH-1 electrode. (c) CV and (d) GCD curves of CC/NiO/$NiCo_2O_4$/NiMn-LDH-4 electrode. (e) CV and (f) GCD curves of CC/NiO/$NiCo_2O_4$/NiMn-LDH-6 electrode.

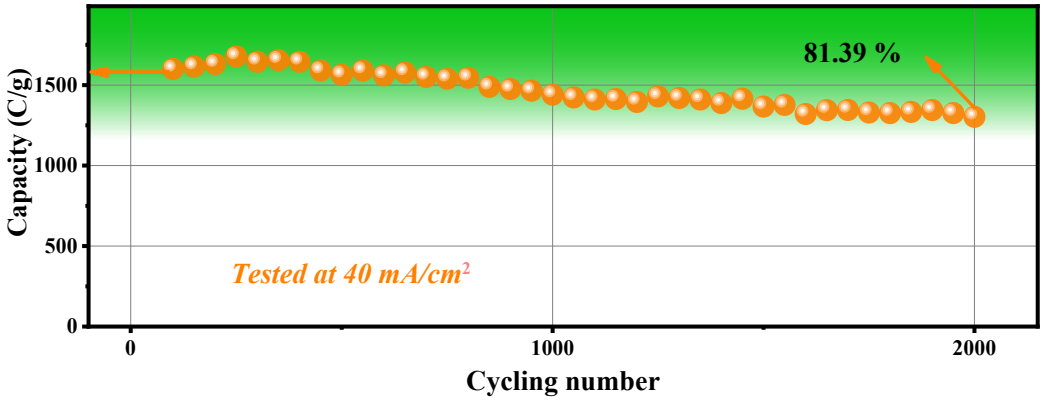

Figure S14 The cycling stability of CC/NiO/$NiCo_2O_4$/NiMn-LDH.

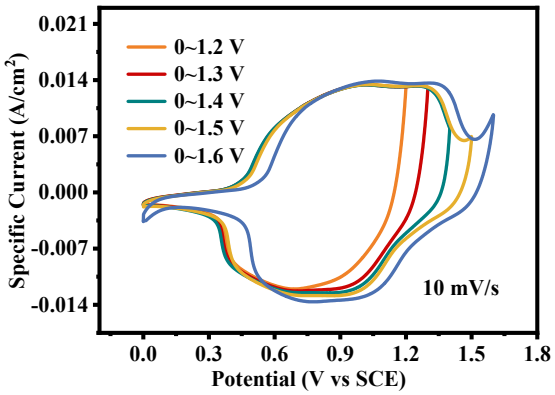

Figure S15 CV curves of HSC device based on different voltage values at the scan rate of 10 mV·s^{-1}.

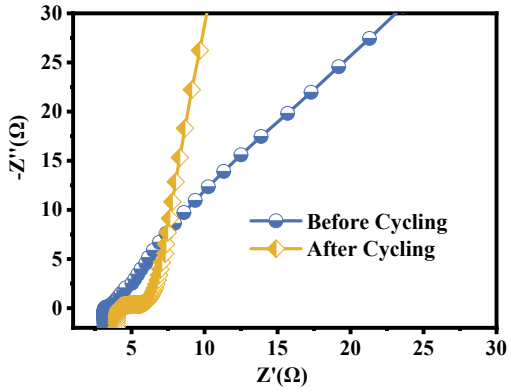

Figure S16. The before and after cycling Nyquist curve of CC/NiO/$NiCo_2O_4$/NiMn-LDH-2//AC HSC.

Table S1. The fitted R_s, R_{ct} and Warburg impedance (W) values.

	$R_s(\Omega)$	$R_{ct}(\Omega)$	W(F)
$NiO/NiCo_2O_4$/NiMn-LDH	1.479	0.2996	2.063
NiMn-LDH	1.618	17.95	0.08715
$NiO/NiCo_2O_4$	1.68	0.1935	0.178
$NiCo_2O_4$	1.511	0.1542	0.3429