Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting Information

The Design and Fabrication of Ultrahigh-Performance Supercapacitor Electrode from Bimetallic PBA/$Ni(OH)_2$/Co_3O_4/NF Quaternary Hybrid Nanocomposites

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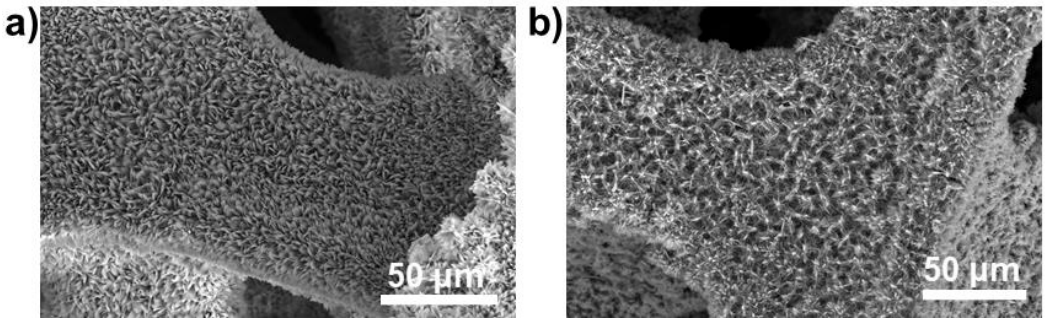

Figure S1 The SEM images of the overall perspective of (a) $Co(OH)_2$/NF and (b) Co_3O_4/NF nanowires.

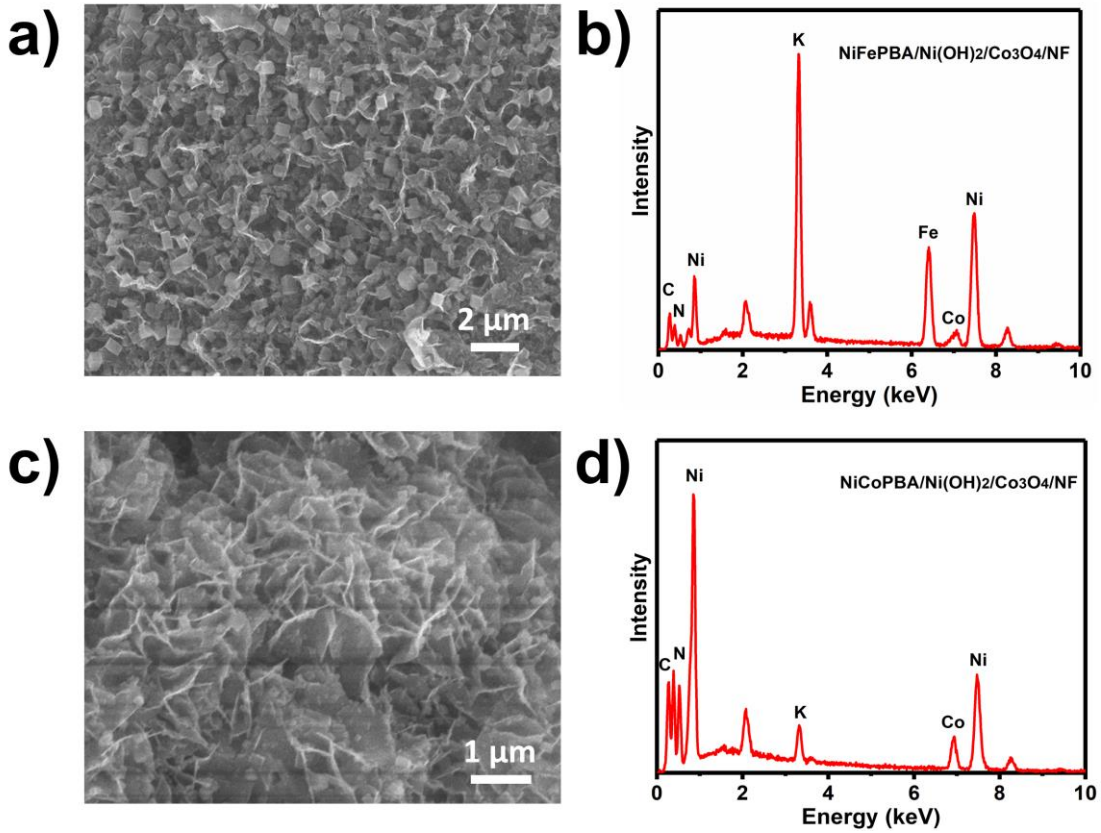

Figure S2 SEM images and corresponding EDS spectra of (a, b) NiFePBA/$Ni(OH)_2$/Co_3O_4/NF and (c, d) NiCoPBA/$Ni(OH)_2$/Co_3O_4/NF.

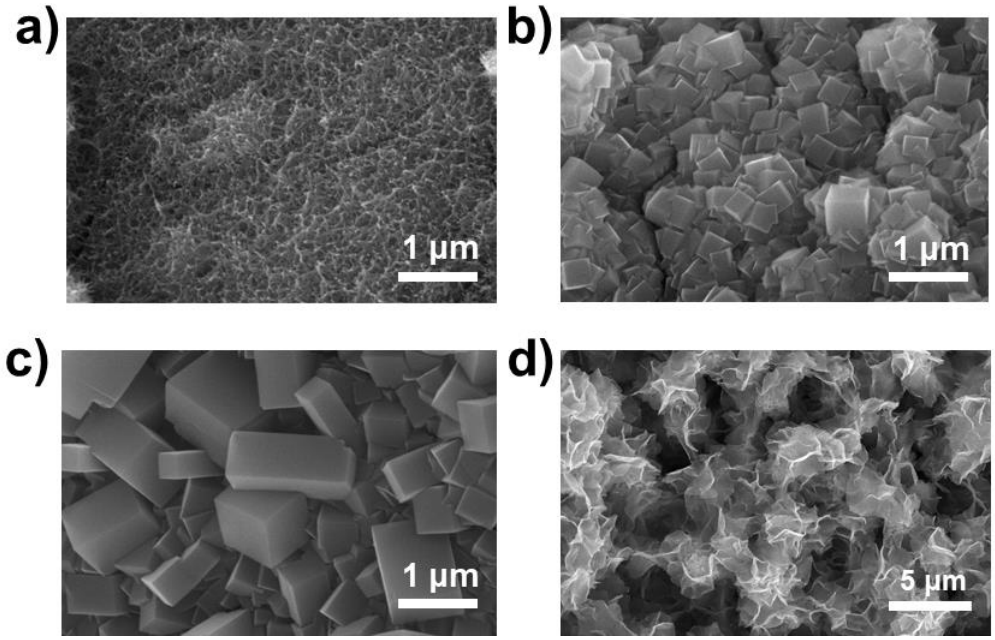

Figure S3 SEM images of (a) $Ni(OH)_2$/NF, (b) NiCoPBA/NF, (c) NiFePBA/NF, and (d) NiCoPBA/NF after cycling test.

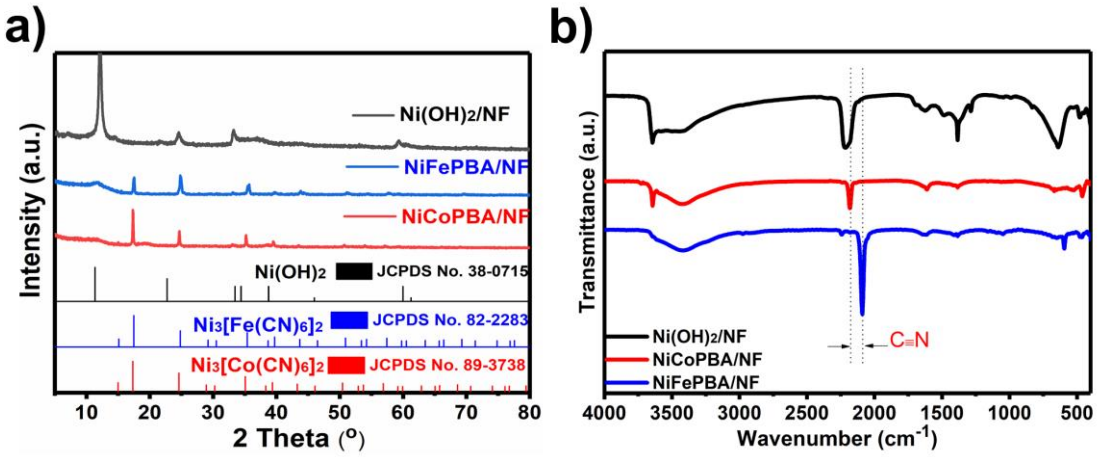

Figure S4 (a) XRD patterns and (b) FT-IR spectra of $Ni(OH)_2$/NF, NiCoPBA/NF, and NiFePBA/NF.

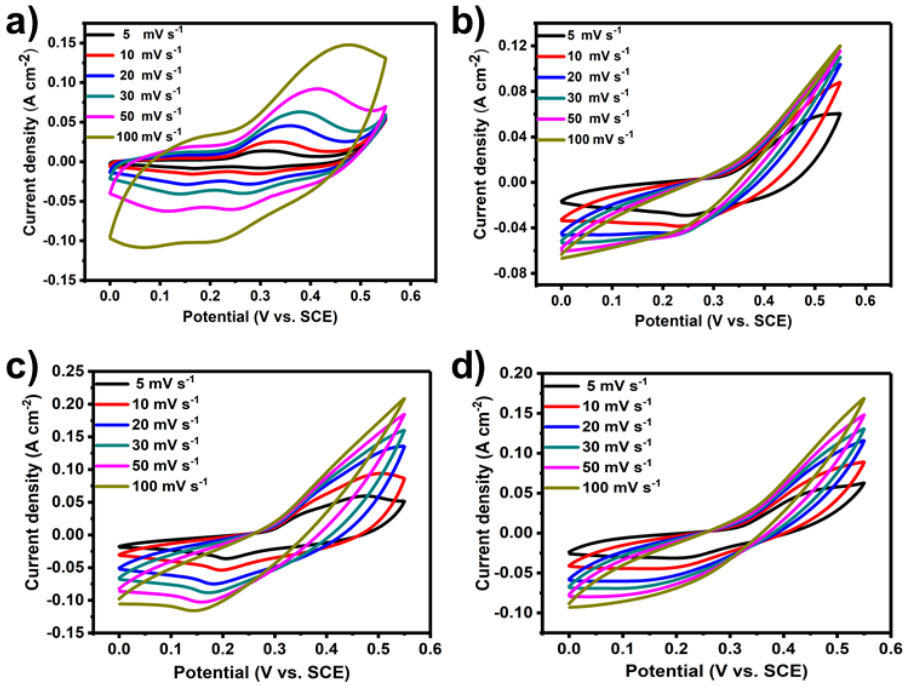

Figure S5 CV curves of (a) Co_3O_4/NF, (b) $Ni(OH)_2/Co_3O_4$/NF, (c) NiFePBA/$Ni(OH)_2/Co_3O_4$/NF, and (d) NiCoPBA/$Ni(OH)_2/Co_3O_4$/NF at different scan rates.

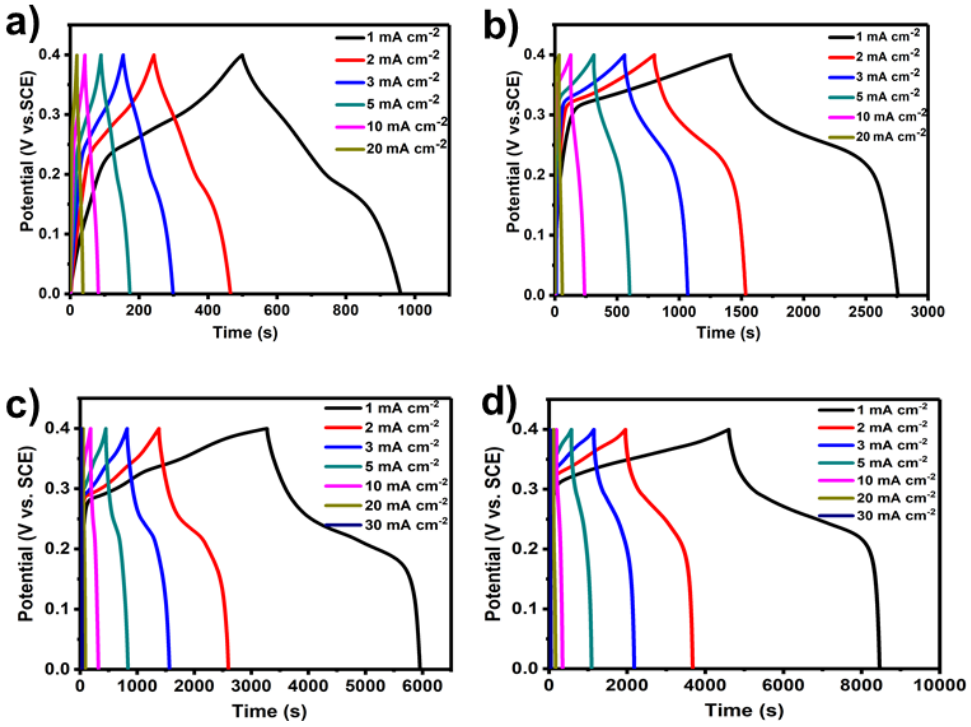

Figure S6 GCD curves of (a) Co_3O_4/NF, (b) $Ni(OH)_2/Co_3O_4$/NF, (c) NiCoPBA/$Ni(OH)_2/Co_3O_4$/NF, and (d) NiFePBA/$Ni(OH)_2/Co_3O_4$/NF at different current densities.

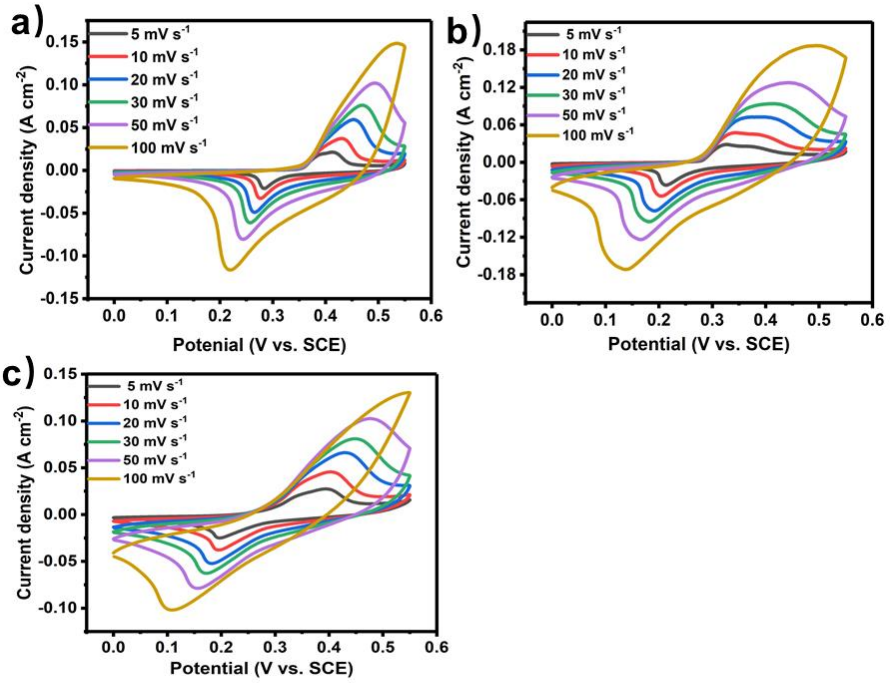

Figure S7 (a) CV curves of (a) $Ni(OH)_2$/NF, (b) NiCoPBA/NF, (c) NiFePBA/NF at different scan rates.

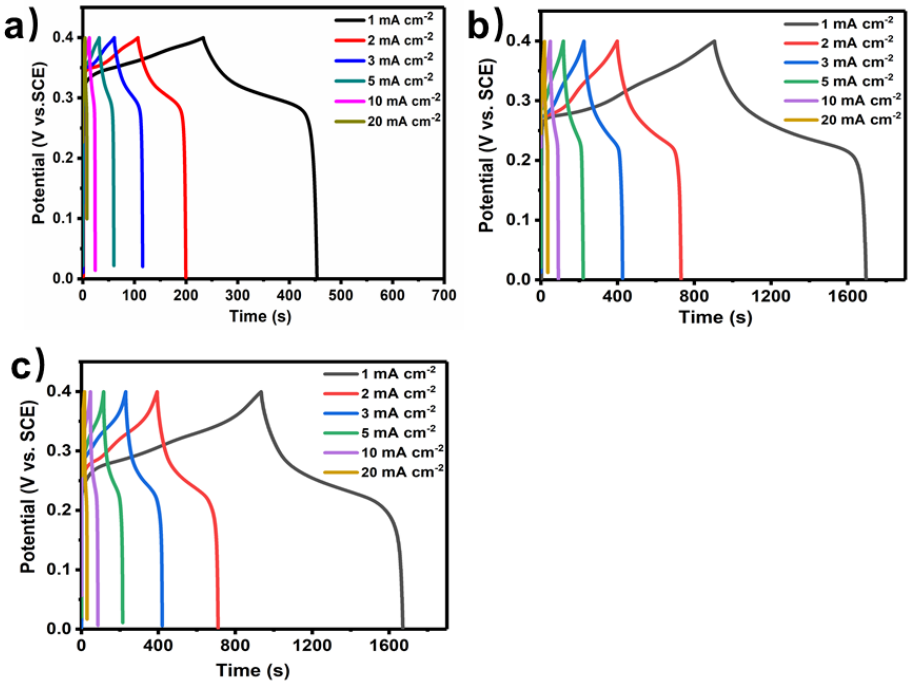

Figure S8 (a) GCD curves of (a) $Ni(OH)_2$/NF, (b) NiCoPBA/NF, (c) NiFePBA/NF at different current densities.

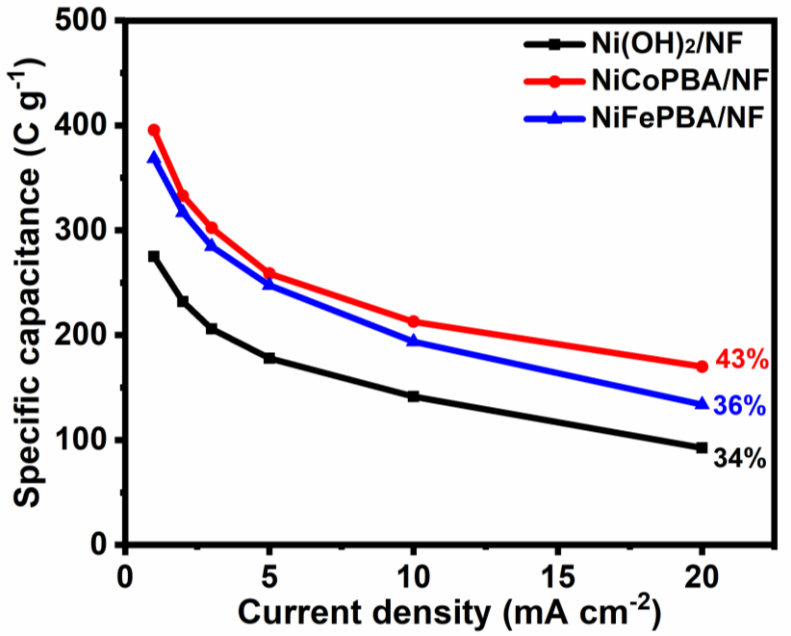

Figure S9 Comparison of the specific capacitance variations of $Ni(OH)_2$/NF, NiCoPBA/NF and NiFePBA/NF at different current densities.

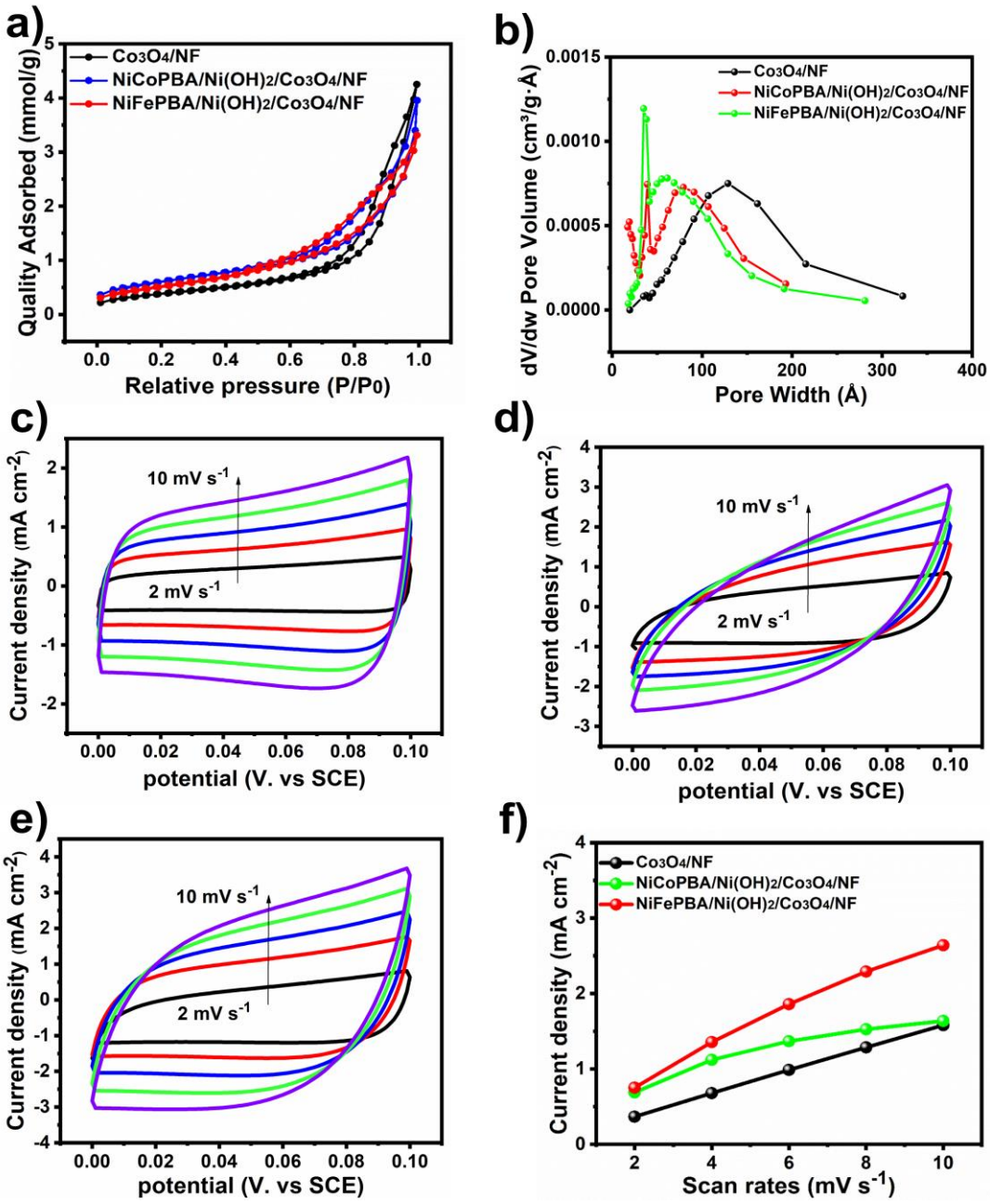

Figure S10 N_2 adsorption/desorption isotherm (a) and pore-size distribution (b) of Co_3O_4/NF, NiCoPBA/Ni(OH)$_2$Co$_3$O$_4$/NF, and NiFePBA/Ni(OH)$_2$/Co$_3$O$_4$/NF. CV curves at different scan rate of 5-10 mV s^{-1} of Co_3O_4/NF (c), NiCoPBA/Ni(OH)$_2$Co$_3$O$_4$/NF (d) and NiFePBA/Ni(OH)$_2$/Co$_3$O$_4$/NF (e). (f) The current density differences (j_0-j_1)/2 plotted against the scan rates.

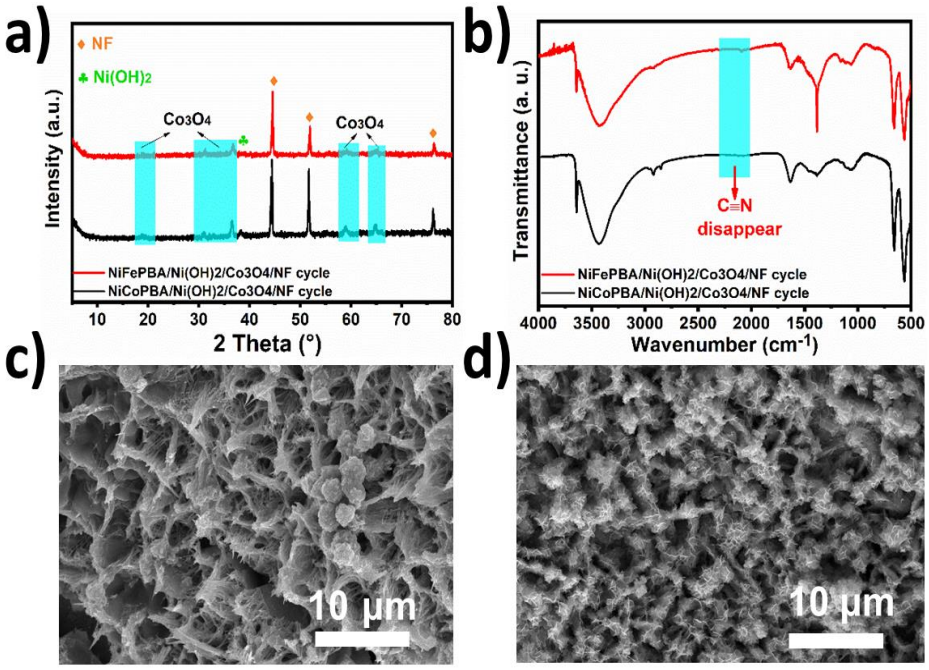

Figure S11 (a) XRD patterns, (b) FT-IR patterns, SEM images of NiCoPBA/$Ni(OH)_2$/Co_3O_4/NF (c) and NiFePBA/$Ni(OH)_2$/Co_3O_4/NF (d) after cycling test.

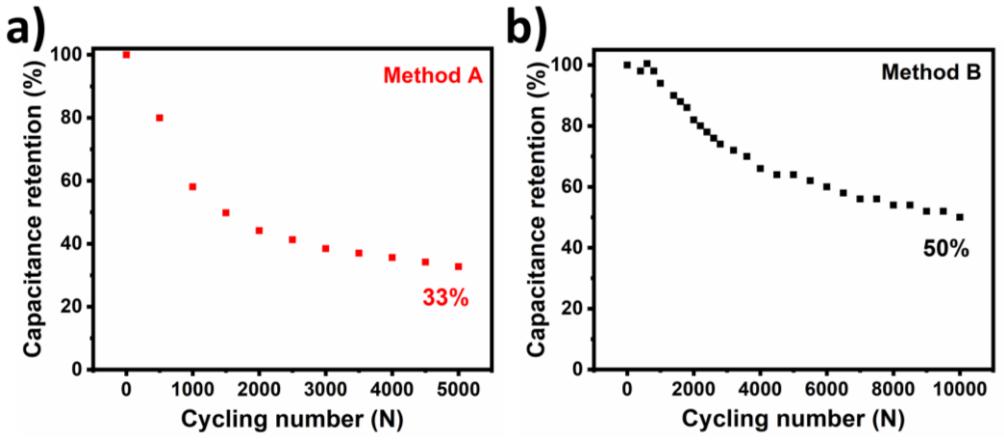

Figure S12 The improved cycling performance of NiCoPBA/$Ni(OH)_2$/Co_3O_4/NF based on two methods (a: Method A, b: Method B).

Method A: Before the test, we fixed two pieces of bare NF on the both sides of NiCoPBA/$Ni(OH)_2$/Co_3O_4/NF electrode to slow down the etching of PBA on the surface of electrode, because the SC performance of bare NF is negligible compared with target composite. After one cycling test for 5000 cycles, capacitance retention of 33%can be remained.

Method B: Before the test, $K_3[Fe(CN)_6]$ of 100 mg was added into electrolyte in order to synchronously convert hydroxide from etched PBA into PBA. The data shows that 50% capacitance retention can be remained after the 10000 cycle stability test.

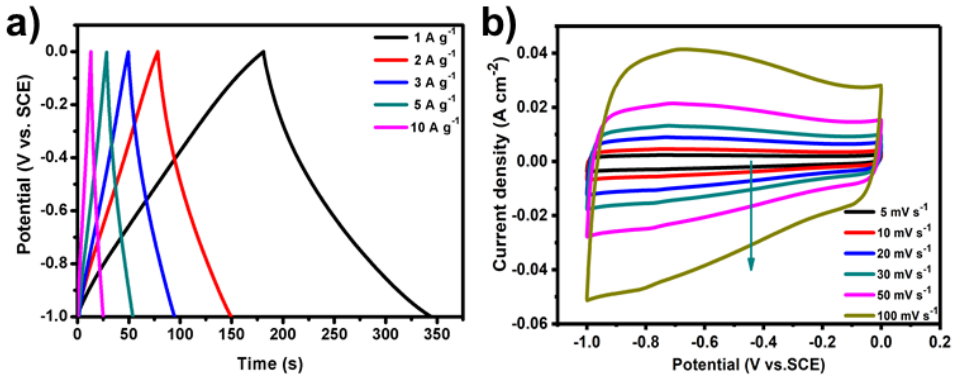

Figure S13 (a) GCD curves of the AC electrode at different current densities (b) CV curves of the AC electrode at different scan rates.