Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting information

Dual Role of Nickel Foam in NiCoAl-LDH Ensuring High-Performance for Asymmetric Supercapacitors

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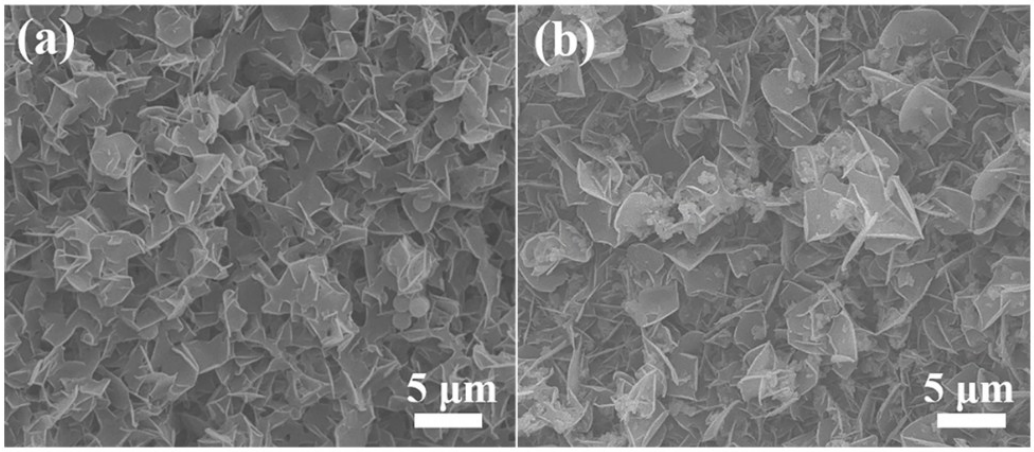

Fig. S1 SEM images of different hydrothermal reaction time, (a) 4 h, (b) 32 h.

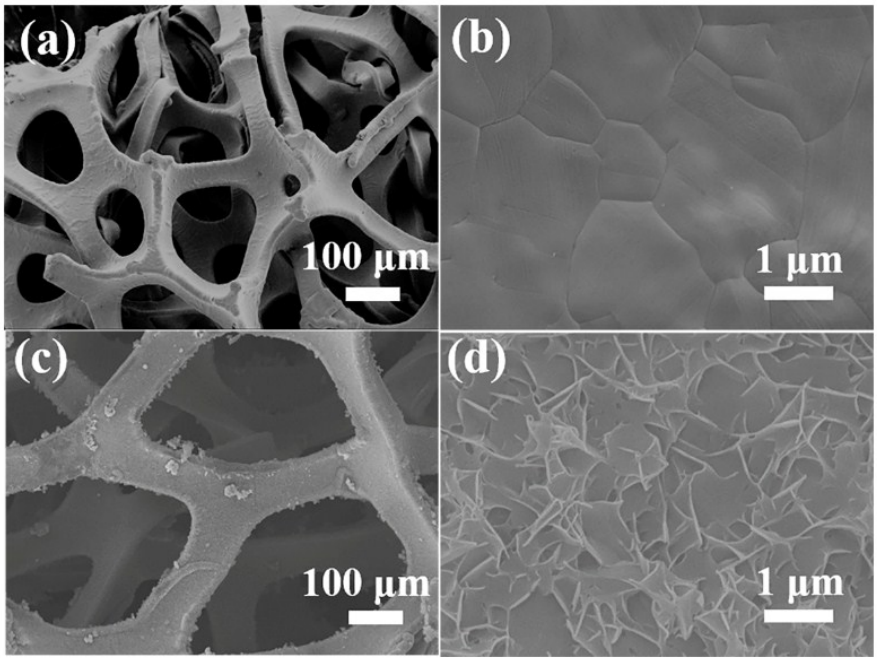

Fig. S2 SEM images of (a, b) pure NF, (c, d) NF covered with electroactive materials.

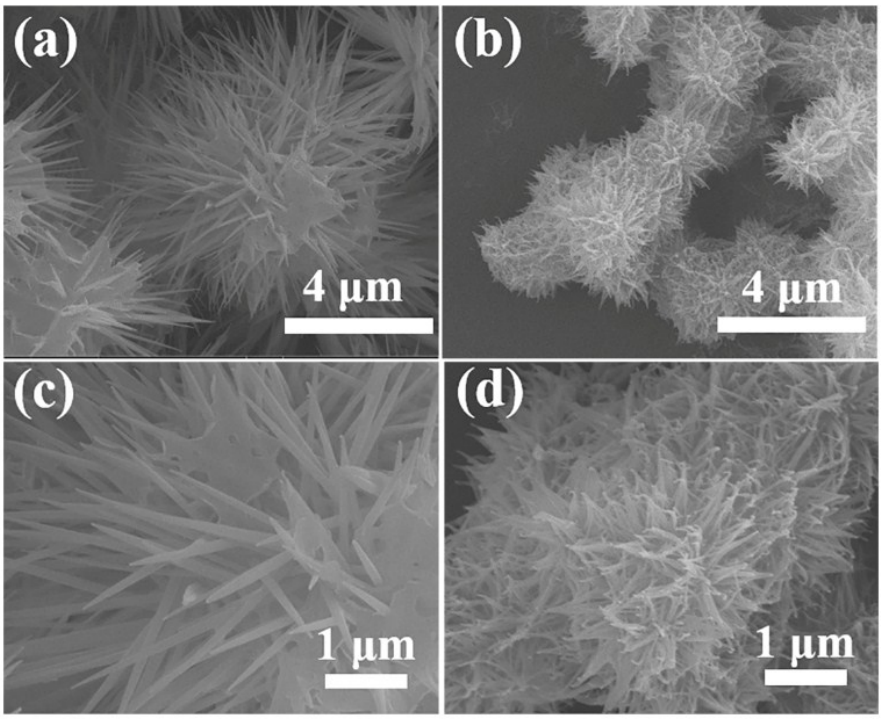

Fig. S3 SEM images of different proportions of nickel and cobalt ions with adscititious nickel: (a, c) Ni:Co-1:3, (b, d) Ni:Co-3:1.

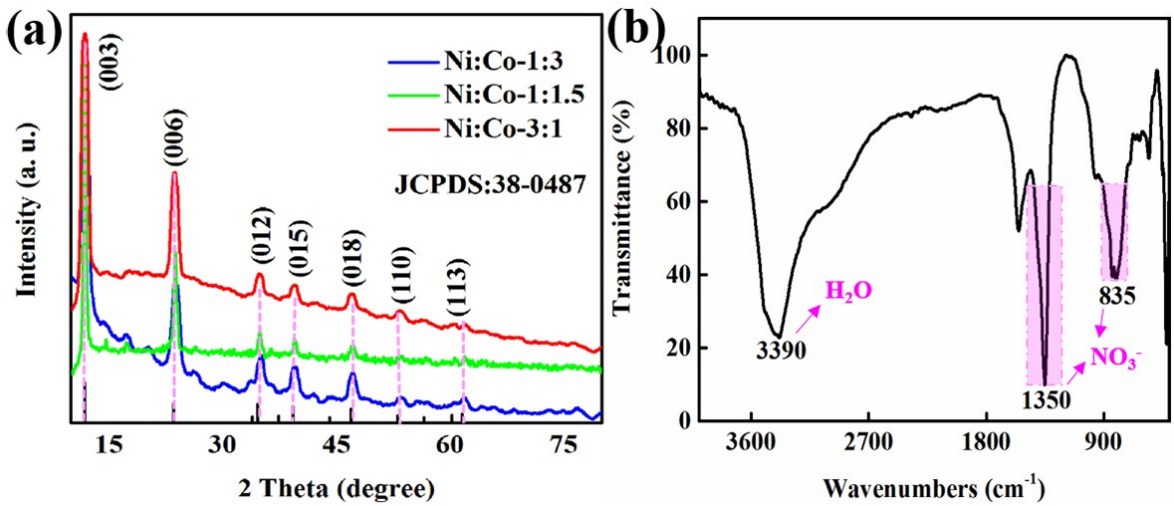

Fig. S4 (a) XRD patterns of different proportions of nickel and cobalt ions, and (b) FT-IR spectra of NCA (Ni:Co-1:1.5).

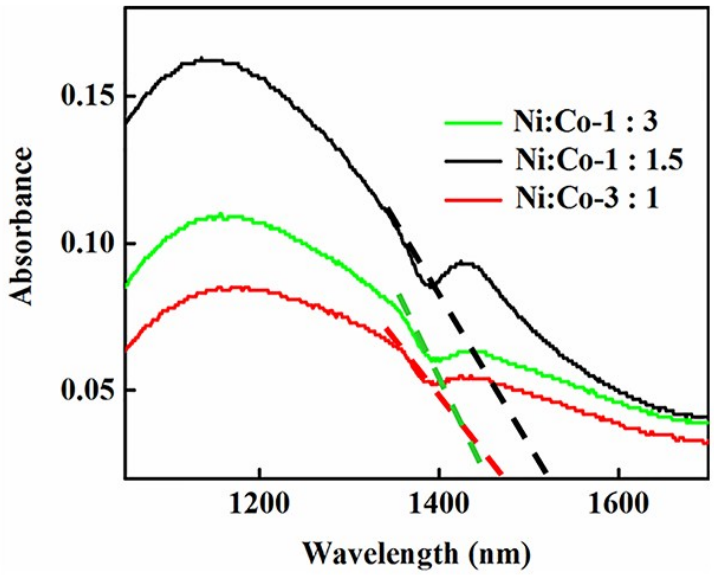

Fig. S5 UV-visible images of NCA composed of different proportions of nickel and cobalt ions.

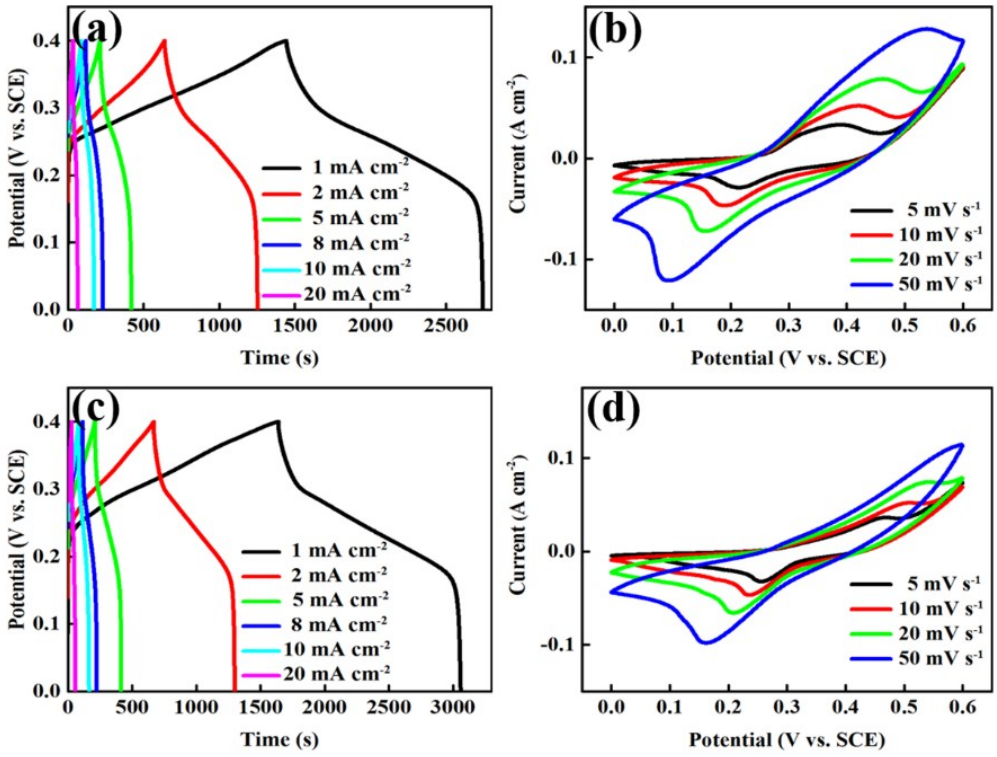

Fig. S6 Charge-discharge curves and cyclic voltammetry curves of NCA composed of different proportions of nickel and cobalt ions. (a, b) Ni:Co-1:3, (c, d) Ni:Co-3:1.

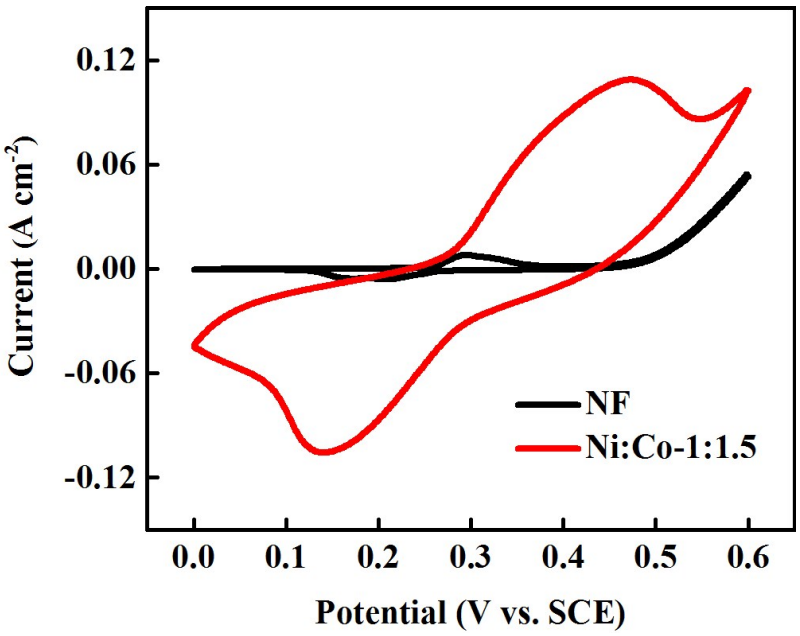

Fig. S7 CV curves comparison at a scan rate of 20 mV s^{-1}.

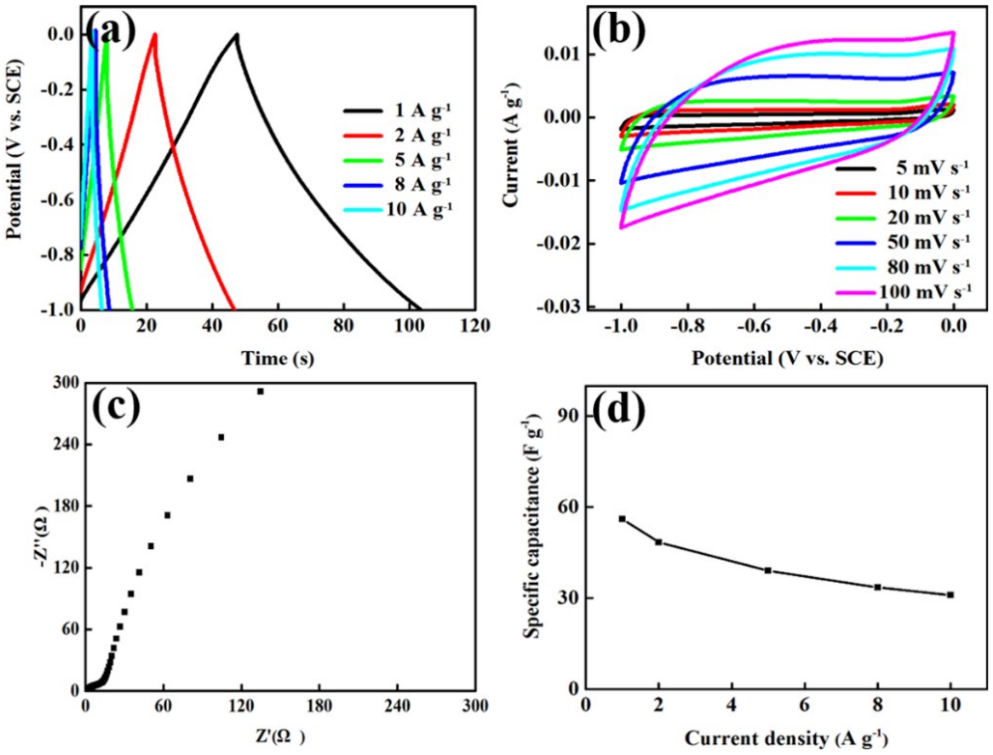

Fig. S8 (a) GCD curves of PAC at different current densities, (b) CV curves of PAC at different scan rates, (c) Nyquist impedance plots, (d) Specific capacitance as a function of discharge current density.

Table S1 Performance comparison of LDH-based materials.

Materials	**Potential window (V/SCE)**	**Morphology**	**Capacitance**	**Stability: retention (cycle numbers)**	**Ref.**
NiAl-LDHs/ MWCNT/NF	0-0.45	Nanosheet/ nanotube	1293 (5 mA cm^{-2})	83% (1000)	S1
Co–Al LDH/ graphene	0-0.5	Laminated structures	712 (1 A g^{-1})	81% (2000)	S2
Ni/Co LDHs	0.05-0.65	Flower-like construction	2228 (1 A g^{-1})	-	S3
CoNi-LDHs	-	Nanoflakes	855.4 (5 mV s^{-1})	77% (1000)	S4
NCA	0-0.4	Nanosheets	5691.2 (1 mA cm^{-2})	73.5% (3000)	This work

Table S2 Various performance parameters of NCA (Ni:Co-1:1.5) using the three-electrode system.

Current density ($mA\ cm^{-2}$)	**Discharge time (s)**	**Areal capacitance** ($mF\ cm^{-2}$)
1	2276.5	5691.25
2	896	4480
5	307	3837.5
8	171	3420
10	129	3225
20	51	2550

Table S3 Various performance parameters for our NCA//PAC asymmetric supercapacitors.

Current density ($mA \cdot cm^{-2}$)	**Discharge Time (s)**	**specific capacitance ($F \cdot g^{-1}$)**	**Energy density ($W \cdot h \cdot Kg^{-1}$)**	**Power density ($W \cdot Kg^{-1}$)**
1	186.5	116.56	41.44	799.9
2	53.5	66.88	23.78	1600.15
5	15	46.88	16.67	4000.8
8	7.5	37.5	13.33	6398.4
10	5	31.25	11.11	7999.2

References

[S1] B. Wang, G. R. Williams, Z. Chang, M. Jiang, J. Liu, X. Lei and X. Sun, ACS Appl. Mater. Interfaces, 2014, **6**, 16304-16311.

[S2] L. Zhang, X. Zhang, L. Shen, B. Gao, L. Hao, X. Lu, F. Zhang, B. Ding, C. Yuan, J. Power Sources., 2012, **199**, 395-401.

[S3] T. Li, G. H. Li, L. H. Li, L. Liu, Y. Xu, H. Y. Ding and T. Zhang, ACS Appl. Mater. Interfaces, 2016, **8**, 2562-2572.

[S4] S. B. Kulkarni, A. D. Jagadale, V. S. Kumbhar, R. N. Bulakhe, S. S. Joshi and C. D. Lokhande, Int. J. Hydrogen Energy, 2013, **38**, 4046-4053.