Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Ultrathin Porous Nickel-Cobalt Hydroxide Nanosheets for High-Performance Supercapacitor Electrodes

Xiaoting Zheng, Zhengxiang Gu, Qingqing Hu, Baoyou Geng, Xiaojun Zhang*

Key Laboratory for Functional Molecular Solids of the Education Ministry of China, College of Chemistry and Materials Science, Center for Nano Science and Technology, Anhui Normal University, Wuhu, 241000, P R China.

Fax: +86-553-3869302; Tel: +86-553-3869303; E-mail: xjzhang@mail.ahnu.edu.cn

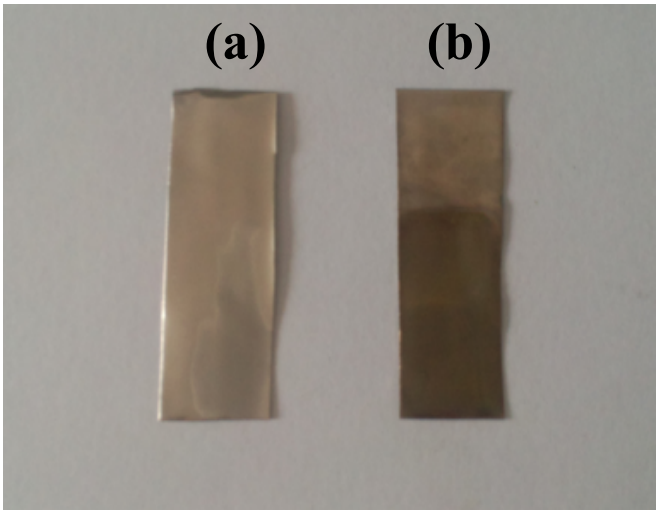

Figure S1 Photograph of bare nickel sheet (a) and nickel-cobalt hydroxide nanosheets/nickel sheet (b) which used as working electrode.

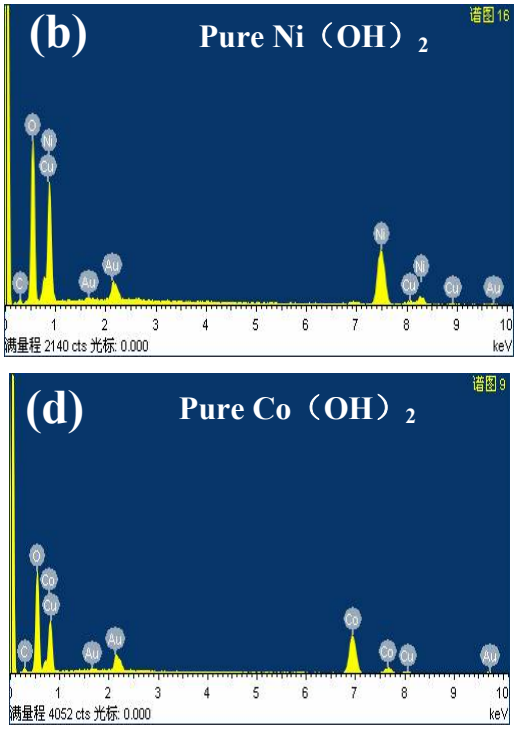

Figure S2 SEM images and EDX spectrum of pure $Ni(OH)_2$ (a,b) and pure $Co(OH)_2$ (c,d).

Figure S3 SEM images of the $Co_{0.66}Ni_{0.33}(OH)_2$ nanosheets with different reaction times: (a) 2h, (b) 4h, (c) 8h, (d) 12h.

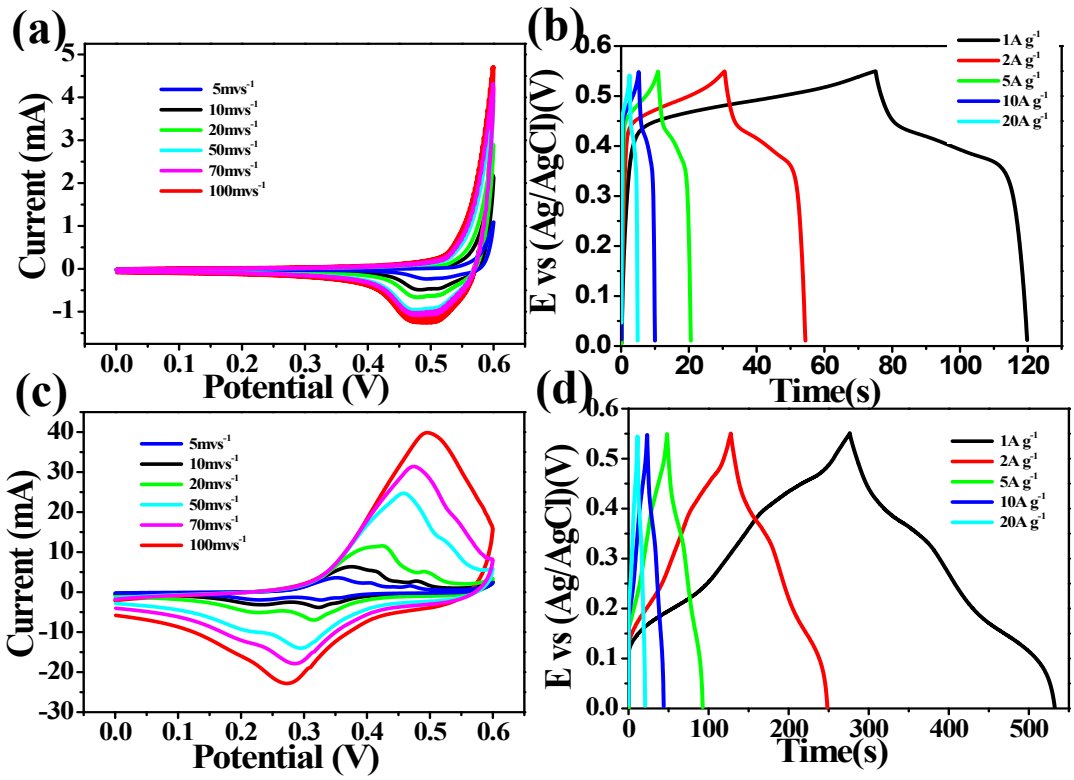

Figure S4 CV curves obtained at different scan rates and galvanostatic charge-discharge curves obtained at different current densities for the sample pure $Ni(OH)_2$ (a,b) and pure $Co(OH)_2$ (c,d).

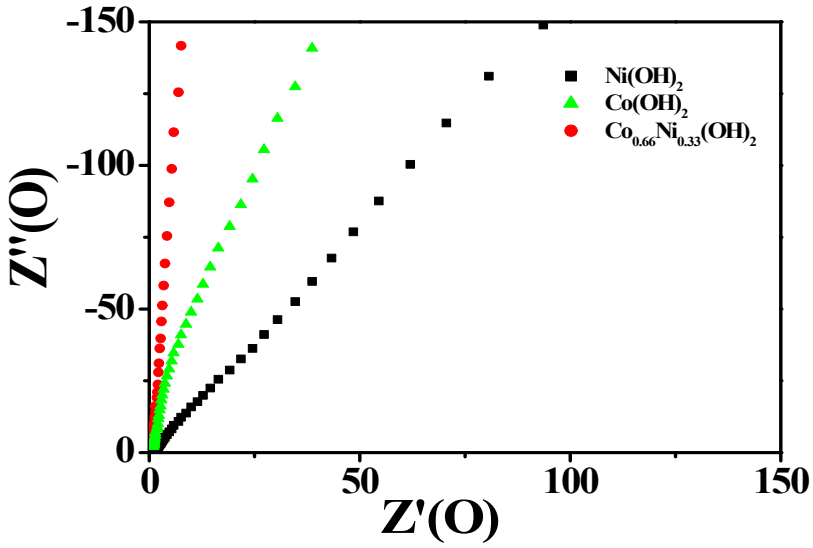

Figure S5 Comparison of Nyquist plots of Ni-Co LDH hybrid-, nickel hydroxide-, and cobalt hydroxide- based electrodes.

Table S1 Comparison of the maximum Cs based on LDH hybrid materials based pseudocapacitive materials and as-prepared electrode materials.

Type	Preparation Method	Electrolyte	Measurement Protocol	Maximum Capacitance ($F\ g^{-1}$)	Ref. (year)
NiAl LDH on Ni foam	Hydrothermal	6 M KOH	10 mA cm^{-2}	701	[1] (2010)
GO/CoAl LDH	Hydrothermal	1 M KOH	1 A g^{-1}	1031	[2] (2011)
NiCo LDHs/Zn_2SnO_4	Electrodepositon	2M KOH	0.5A g^{-1}	1805	[3] (2012)
Hollow NiAl LDH	Hydrothermal	1 M KOH	2 A g^{-1}	735	[4] (2012)
CoAl LDH/GO	Hydrothermal	6 M KOH	1 A g^{-1}	772	[5] (2012)
NiAl LDH/a-GNS	Hydrothermal	6 M KOH	0.1A g^{-1}	1730.2	[6] (2013)
$Co_{1-x}Ni_x$ LDHs	Electrodepositon	2 M KOH	5 mV s^{-1}	1213	[7] (2013)
MWCNT/NiCoAl LDH	Simple Refluxing	6 M KOH	1 A g^{-1}	1035	[8] (2013)
graphene sheets/NiCo LDH	Microwave synthesis	6M KOH	1A g^{-1}	1980	[9] (2013)
CoAl LDH@$Ni(OH)_2$	Hydrothermal & Electrodepositon	2 M KOH	5 mA cm^{-2}	1528	[10] (2014)
graphene/NiAl LDH	Hydrothermal	3M KOH	2A g^{-1}	915	[11] (2014)
NiAl LDH on Ni foam	CBD & Hydrothermal	1 M KOH	0.5 A g^{-1}	795	[12] (2014)
rGO/$Ni_{0.83}Co_{0.17}Al$ LDH	Hydrothermal	6M KOH	1A g^{-1}	1902	[13] (2014)
NiCo LDH on metal nickel	Hydrothermal	1M KOH	1A g^{-1}	2184	This work

References

[1] J. Wang, Y. Song, Z. Li, Q. Liu, J. Zhou, X. Jing, M. Zhang, Z. Jiang, Energy & Fuels. 2010, 24 , 6463-6467.

[2] L. Wang, D. Wang, X.Y. Dong, Z. J. Zhang, X.F. Pei, X.J. Chen, B. Chen, J. Jin, Chem Commun. 2011, 47 , 3556-3558 .

[3] X. Wang, A. Sumboja, M. Lin, J. Yan, P. S. Lee, Nanoscale. 2012, 4 , 7266 .

[4] M. Shao, F. Ning, Y. Zhao, J. Zhao, M. Wei, D.G. Evans, X. Duan, Chem. Mater. 2012, 24 , 1192-1197 .

[5] J. Fang, M. Li, Q. Li, W. Zhang, Q. Shou, F. Liu, X. Zhang, J. Cheng, Electrochim. Acta. 2012, 85 , 248-255 .

[6] N. Yulian, L. Ruiyi, L. Zaijun, F. Yinjun, L. Junkang, Electrochim. Acta. 2013, 94 , 360-366 .

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

[8] J. Yang, C.Yu, X. Fan, Z. Ling, J. Qiu, Y. Gogotsi, J. Mater. Chem. A. 2013, 1 , 1963 .

[9] Yan Tao, Li Ruiyi, Li Zaijun, Materials Research Bulletin. 2014, 51 , 97–104 .

[10] Wei Honga, Jinqing Wang, Lengyuan Niu, Jinfeng Sun, Peiwei Gong, Shengrong Yang, Journal of Alloys and Compounds. 2014, 608 , 297–303 .

[11] Yasodinee Wimalasiria, Rong Fan, X.S. Zhao, Linda Zou, Electrochimica Acta. 2014, 134 , 127–135 .

[12] B. Wang, Q. Liu, Z.Y. Qian, X.F. Zhang, J. Wang, Z.S. Li, H.J. Yan, Z. Gao, F.B. Zhao, L.H. Liu, J. Power Sources. 2014, 246 , 747-753 .

[13] Jie Xu, Shili Gai, Fei He, Na Niu, Peng Gao, Yujin Chen, Piaoping Yang, Dalton Trans. 2014, 43 , 11667–11675.

Figure S6 SEM images of $Co_{0.66}Ni_{0.33}(OH)_2$ electrode before (a) and after (b) 2000th cycle .

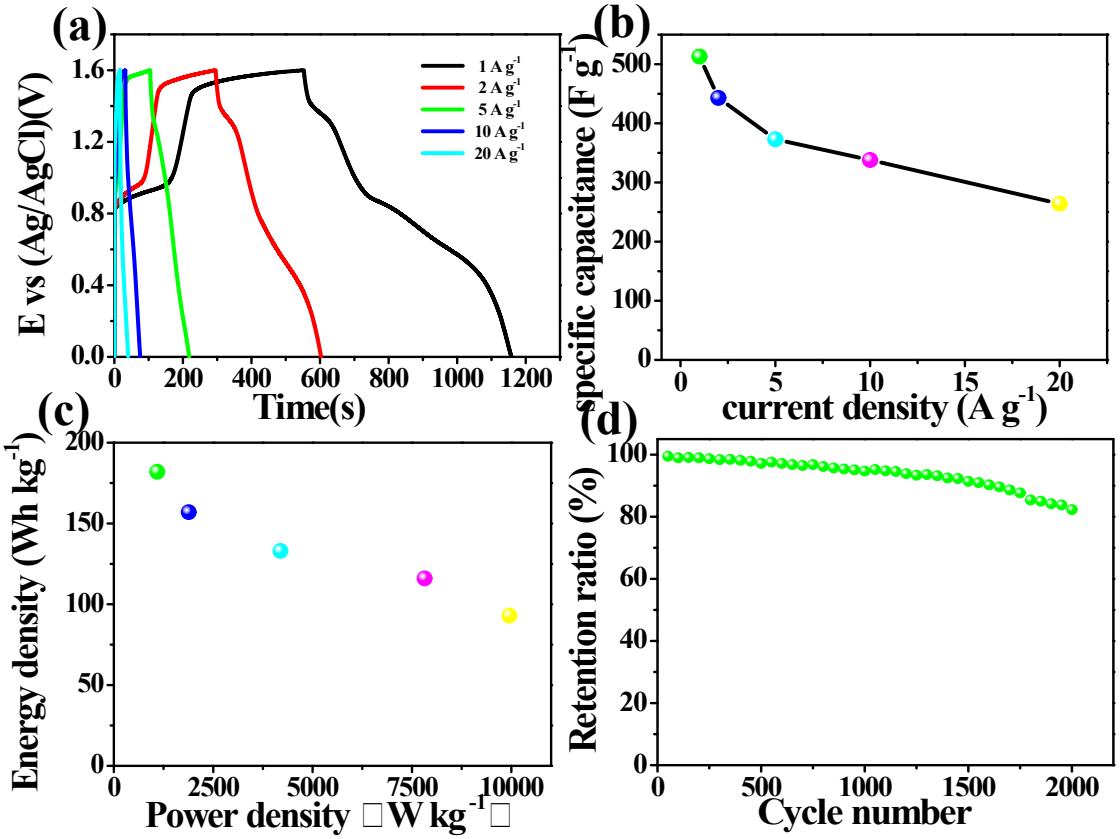

Figure S7 (a) Galvanostatic charge-discharge curves of the $Co_{0.66}Ni_{0.33}(OH)_2$//AC asymmetric supercapacitor at different current densities; (b) specific capacitance vs. scan rate of the $Co_{0.66}Ni_{0.33}(OH)_2$//AC asymmetric supercapacitor; (c) energy density vs. power density curves of the $Co_{0.66}Ni_{0.33}(OH)_2$//AC asymmetric supercapacitor; (d) cycling performance of the $Co_{0.66}Ni_{0.33}(OH)_2$//AC asymmetric supercapacitor at the current density of 1A g^{-1}.