Supplementary Information

Nitrogen-doped carbon sheets coated on $CoNiO_2$@textile carbon as bifunctional electrodes for asymmetric supercapacitor

Rui Guo, Jing Li, Yufeng Jia, Fuen Xin, Jie Sun, Liqin Dang, Zonghuai Liu, Zhibin Lei*

Key Laboratory of Applied Surface and Colloid Chemistry, MOE, Shaanxi Engineering Lab for Advanced Energy Technology, Shaanxi Key Laboratory for Advanced Energy Devices, School of Materials Science and Engineering, Shaanxi Normal University, 620 West Chang'an Street, Xi'an, Shaanxi, 710119, China, Fax: 86-29-81530702; Tel: 86-29-81530810; Email: zblei@snnu.edu.cn

*Corresponding Author:

Prof. Zhibin Lei, School of Materials Science and Engineering, Shaanxi Normal University, 199 South Chang'an Road, Xi'an, Shaanxi, 710062, China. Email: zblei@snnu.edu.cn; Tel: 86-29-81530810; Fax: 86-29-81530702

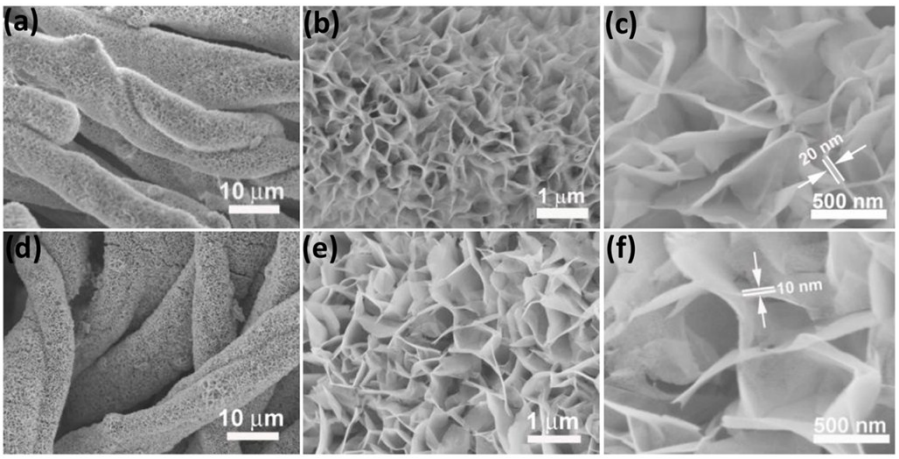

Figure S1. SEM images of NiCo-LDH@aTC (a-c) and CoNi@aTC (d-f) by thermally annealing NiCo-LDH@aTC at 400 °C in flowing N_2.

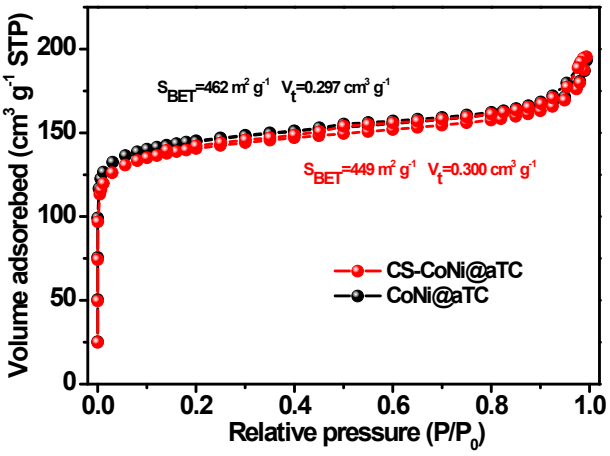

Figure S2. Nitrogen adsorption-desorption isotherms of CS-CoNi@aTC and CoNi@aTC electrodes.

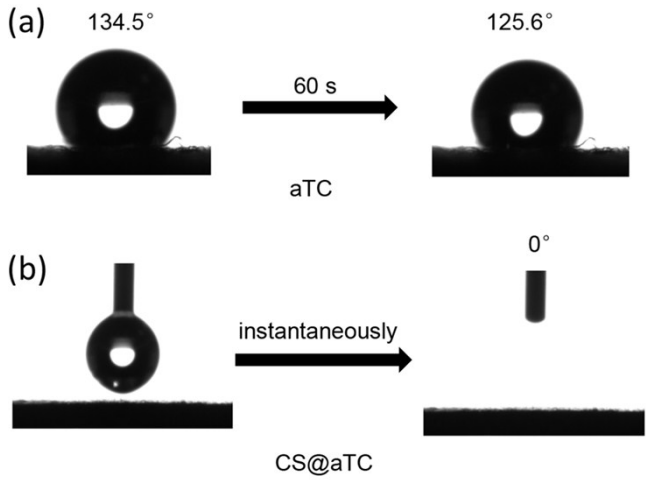

Figure S3. Water contact angle measurement of aTC and CS@aTC electrodes.

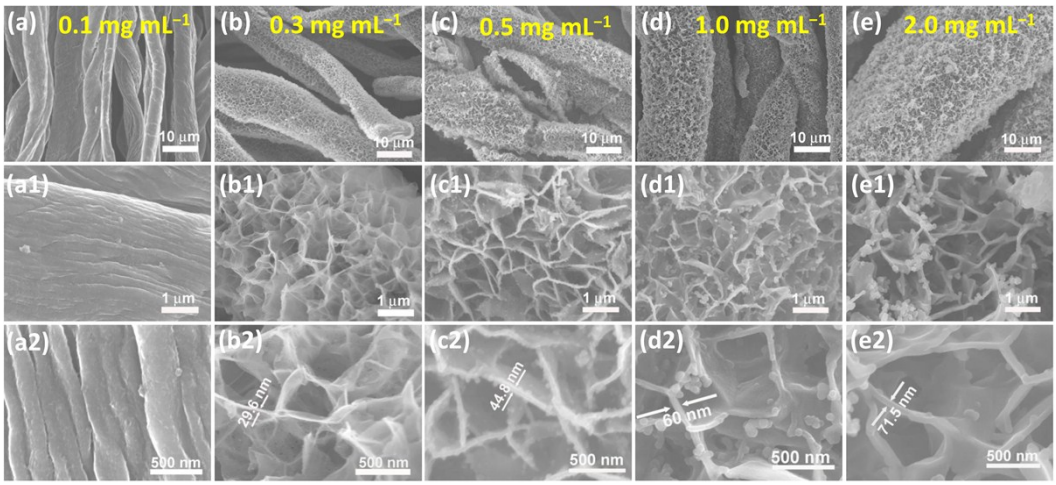

Figure S4. SEM images of CS@aTC prepared with different concentrations of dopamine.

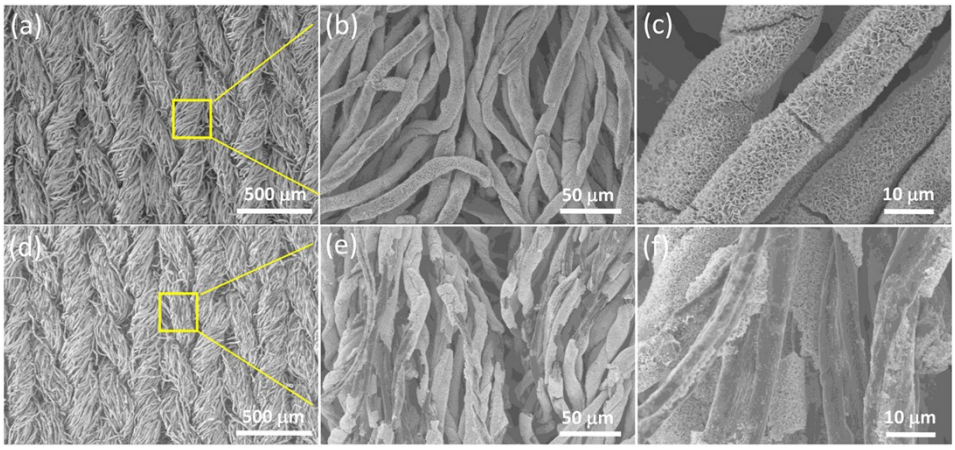

Figure S5. SEM images of CS-CoNi@aTC (a-c) and CoNi@aTC (d-f) after continuous charging and discharging process at current density of 30 mA cm^{-2} for 40000 and 8000 cycles, respectively.

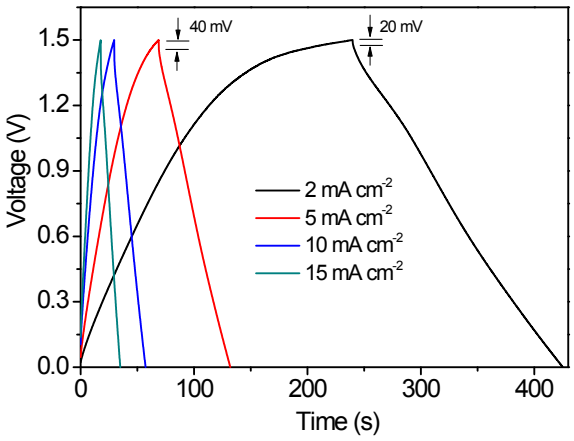

Figure S6. Galvanostatic charge-discharge curves of an aqueous-based ASC device built with CS-CoNi@aTC as positive electrode, CS@aTC as negative electrode and 2.0 M KOH as aqueous electrolyte.

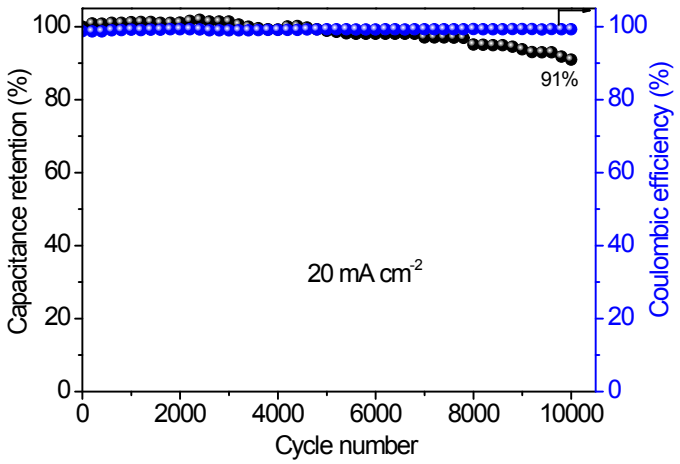

Figure S7. Cycling stability of solid-state ASC device tested at 20 mA cm^{-2}.

Table S1. Performance comparison of our solid-state ASC with previous literatures.

Supercapacitor devices	**Energy density** ($mWh\ cm^{-3}$)	**Power density** ($mW\ cm^{-3}$)	**Electrolyte**	**Ref.**
MnO_2/CC//CoP/CC	0.69	114.2	PVA/LiCl	1
rGO	1.24	890	H_2SO_4-intercalated GO	2
$Ni(OH)_2$-RGO/Ni//RGO/Ni	0.83	3430,	PVA/KOH	3
carbon-nanotube/graphene fibrous films	2.7	295.8	PVA/H_2SO_4	4
Co_9S_8//Co_3O_4@RuO_2	1.44	890	PVA/KOH	5
MnO_2@CuO//Fe_2O_3@C	0.85	100	PVA/LiCl	6
PPy/rGO//NCs	1.01	19.3	PVA/LiCl	7
TiN@GNS//Fe_2N@GNS	0.55	220	PVA/LiCl	8
TNOxG//TNOxG-SSC	0.58	570	PVA/H_2SO_4	9
MnO_2/CNT-web paper//Fe_2O_3/CFs	0.43	20	PVA/$LiClO_4$	10
rGO/CNT	1.7	0.8	[EMIM][TFSI] gel electrolyte	11
MnO_2//Fe_2O_3	0.41	60	PVA/LiCl	12
MnO_2//Ti-Fe_2O_3@PEDOT	0.89	380	PVA/LiCl	13
CNTs//Fe_3O_4–C	1.56	480	PVA/KOH	14
CS-CoNi@aTC//CS@aTC	**1.4**	**24**	**PVA-KOH**	**This work**

References

1. Z. Zheng, M. Retana, X. Hu, R. Luna, Y. H. Ikuhara and W. Zhou, *ACS Appl. Mater. Interfaces*, 2017, 9, 16986-16994.
2. C. Ogata, R. Kurogi, K. Awaya, K. Hatakeyama, T. Taniguchi, M. Koinuma and Y. Matsumoto, *ACS Appl. Mater. Interfaces*, 2017, 9, 26151.
3. K. Lu, J. Zhang, Y. Wang, J. Ma, B. Song and H. Ma, *Acs Sustainable Chemistry & Engineering*, 2017, 5, 821-827.
4. Y. Yu, J. Zhong, W. Sun, R. Kumar and N. Koratkar, *Adv. Funct. Mater.*, 2017, 27, 1606461.
5. X. Jing, W. Qiufan, W. Xiaowei, X. Qingyi, L. Bo, C. Di and S. Guozhen, *ACS Nano*, 2013, 7, 5453-5462.
6. Y. Zenan, M. Julian, C. Jean, Z. Lei and T. Jayan, *Small*, 2015, 11, 5289-5295.
7. J. Zhu, T. Feng, X. Du, J. Wang, J. Hu and L. P. Wei, *J. Power Sources*, 2017, 346, 120-127.
8. C. Zhu, P. Yang, D. Chao, X. Wang, X. Zhang, S. Chen, B. K. Tay, H. Huang, H. Zhang and W. Mai, *Adv. Mater.*, 2015, 27, 4566-4571.
9. X. Zhang, S. Deng, Y. Zeng, M. Yu, Y. Zhong, X. Xia, Y. Tong and X. Lu, *Adv. Funct. Mater.*, 2018, 28, 1805618.
10. B. Patil, S. Ahn, S. Yu, H. Song, Y. Jeong, H. K. Ju and H. Ahn, *Carbon*, 2018, 134, 366-375.
11. X. Zang, R. Zhang, Z. Zhen, W. Lai, C. Yang, F. Kang and H. Zhu, *Nano Energy*, 2017, 40, 224-232.
12. L. Xihong, Z. Yinxiang, Y. Minghao, Z. Teng, L. Chaolun, X. Shilei, B. Muhammad-Sadeeq and T. Yexiang, *Adv. Mater.*, 2014, 26, 3148-3155.
13. Y. Zeng, Y. Han, Y. Zhao, Y. Zeng, M. Yu, Y. Liu, H. Tang, Y. Tong and X. Lu, *Adv. Energy Mater.*, 2015, 5, 1402176.
14. R. Li, Y. Wang, C. Zhou, C. Wang, X. Ba, Y. Li, X. Huang and J. Liu, *Adv. Funct. Mater.*, 2015, 25, 5384-5394