

### Supporting information

#### An Alkalized MXene/Carbon Nnotube Composite for Dendrite-free Na Deposition

Weisong Meng, Bo Wang, Junkai Zhao, Guilin Jiang, Chenxiao Chu\*, Feipeng Cai\*

Energy Institute, Qilu University of Technology (Shandong Academy of Sciences),  
Jinan, 250014, China

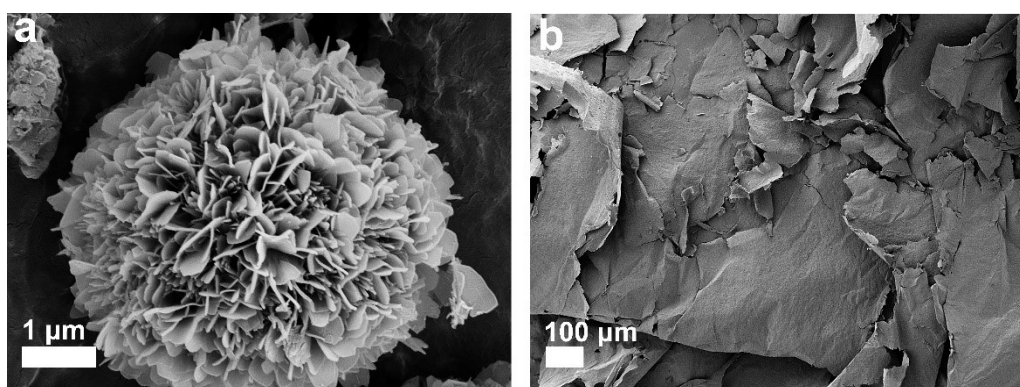


Fig.S1 (a)SEM images of microsphere formed by the complete alkalization of MXene. (b)SEM images of Ti<sub>3</sub>C<sub>2</sub> MXene.

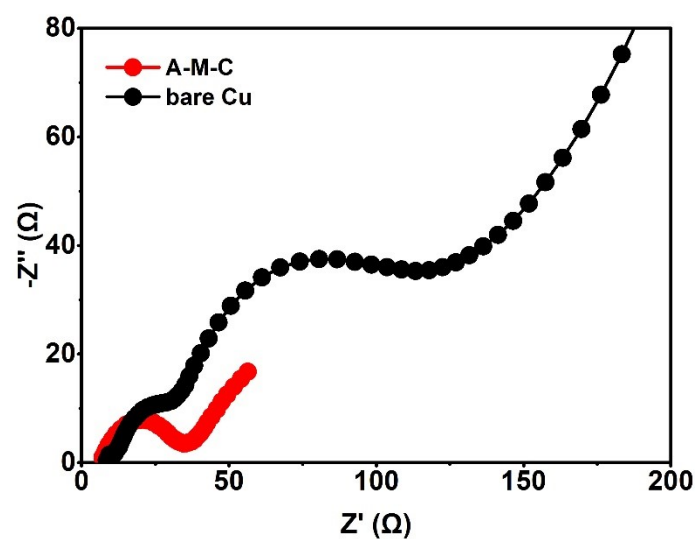


Fig.S2 Impedance spectra of Na depositing on A-M-C anode and bare Cu anode after 10 cycles at a current density of 1 mA cm<sup>-2</sup> with a deposition capacity of 1 mA h cm<sup>-2</sup>.

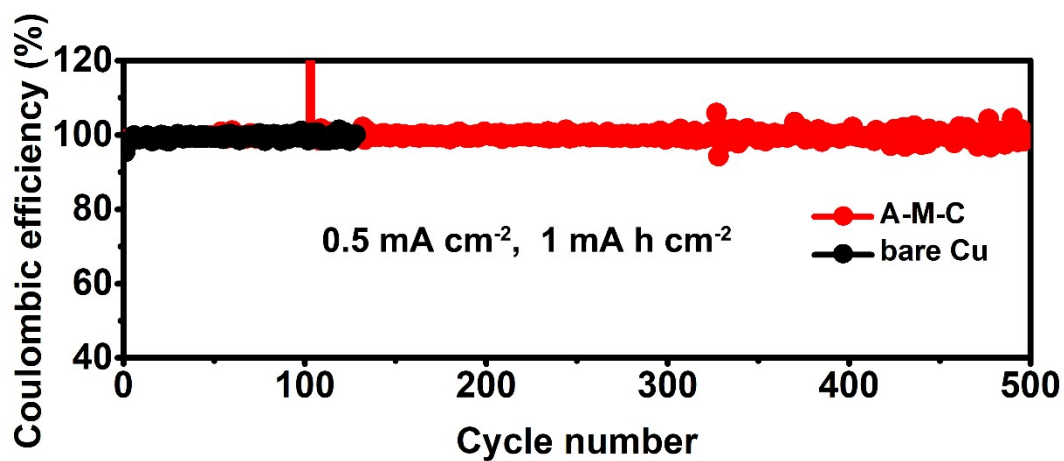


Fig.S3 Comparison of the coulombic efficiency of A-M-C and bare Cu at current density of 0.5 mA cm<sup>-2</sup> for the capacity of 1 mA h cm<sup>-2</sup>.

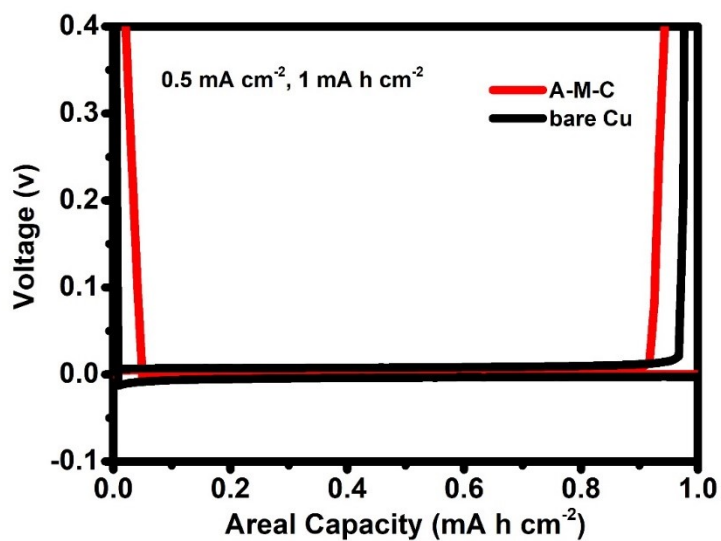


Fig.S4 The corresponding voltage profiles of Na plating/stripping on A-M-C and bare Cu in the first cycle.

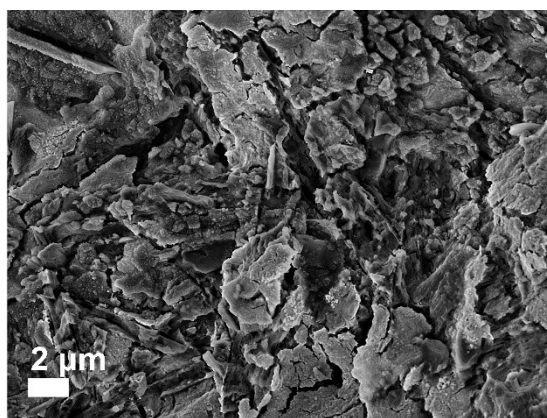


Fig.S5 SEM images of Cu after plating 1 mA h cm<sup>-2</sup> Na.

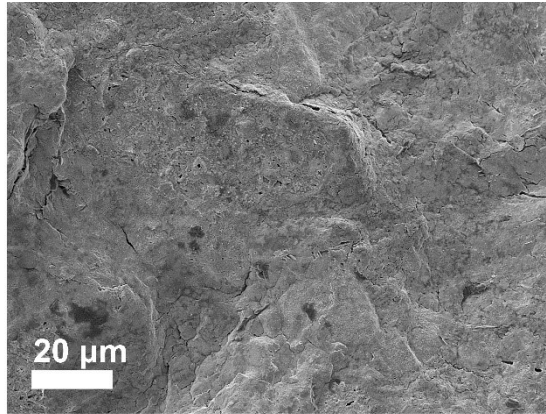


Fig.S6 SEM images of A-M-C after plating 3 mA h cm<sup>-2</sup>.

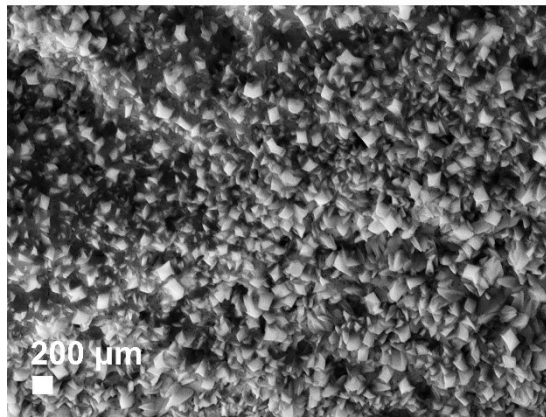


Fig.S7 SEM images of Cu after 10 cycles at 1 mA cm<sup>-2</sup> for capacity of 1 mA h cm<sup>-2</sup>.

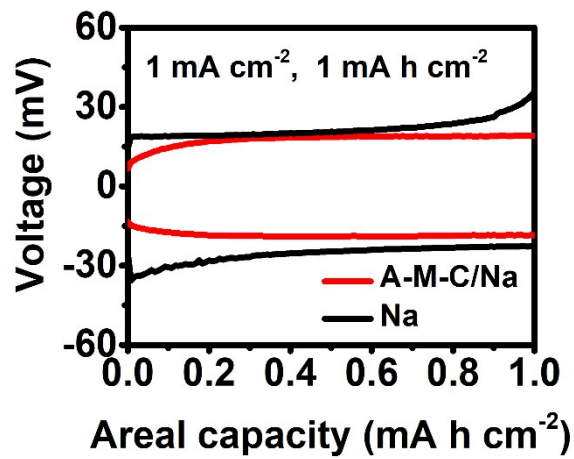


Fig.S8 Voltage profiles of A-M-C/Na and Na at the 1st cycle with a capacity of 1 mA h cm<sup>-2</sup> at 1 mA cm<sup>-2</sup>.

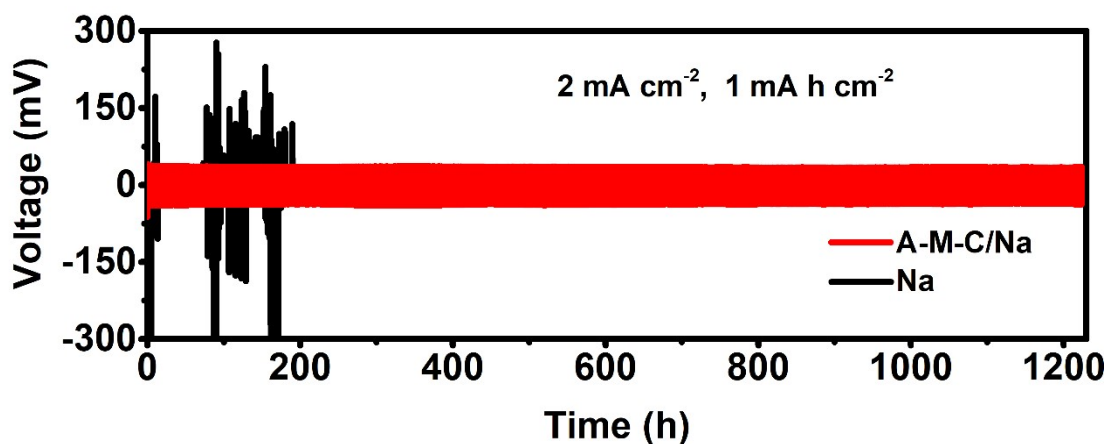


Fig.S9 Voltage profiles of Na metal plating/stripping in A-M-C/Na and Na symmetric cells at 2 mA cm<sup>-2</sup> with capacity fixed at 1 mA h cm<sup>-2</sup>.

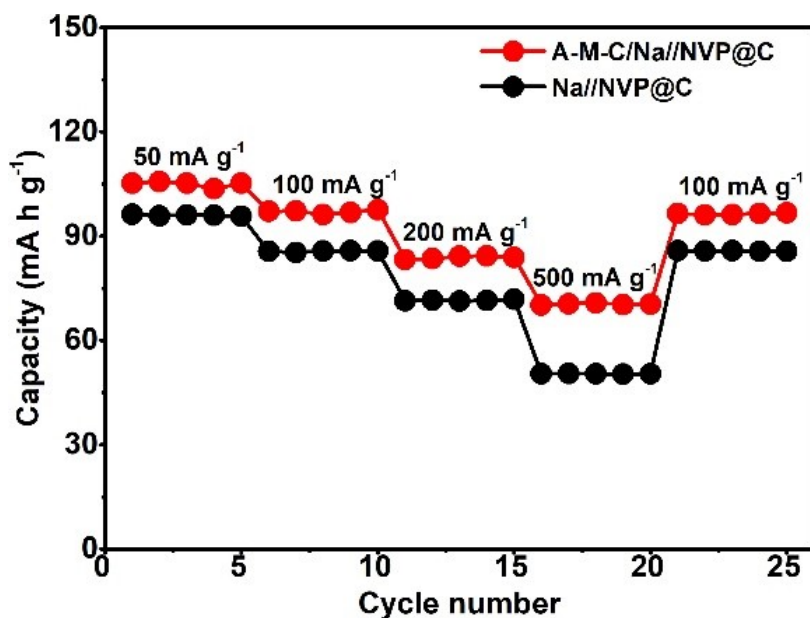


Fig.S10 Rate performance of A-M-C/Na//NVP@C and Na//NVP@C full cells.

Table R1: The electrochemical properties of hybrid and non-hybrid MXene materials in sodium metal batteries were described in detail.

Reference	Half cell	Symmetric cell
	Current density (mA cm <sup>-2</sup> ), Capacity (mAh cm <sup>-2</sup> ), Cycle number, Coulombic efficiency(%)	Current density(mA cm <sup>-2</sup> ), Capacity(mAh cm <sup>-2</sup> ), Cycle time(h), Overpotential(mV)
This work	0.5, 1, 300, 99.1	0.5, 1, 1700, 17
	1, 1, 300, 99.1	1, 1, 1400, 20
rGO/MXene <sup>[1]</sup>	2, 1, 300, 99.9	2, 1, 1200, 34

	0.5, 1, 700, 99.5	1, 1, 1700, 34
		3, 1, 1700, -
C-NTO <sup>[2]</sup>	3, 3, 300, 99.4	3, 3, 400, -
	10, 5, 200, 98.8	5, 20, 320, 77.5
		1, 1, 4000, 110
h-Ti <sub>3</sub> C <sub>2</sub> /CNTs <sup>[3]</sup>	1, 1, 1000, 99.2	3, 3, 1200, 80
		5, 5, 450, 100
		10, 1, 80, 130
Na-Ti <sub>3</sub> C <sub>2</sub> T <sub>x</sub> -CC <sup>[4]</sup>	1, 1, 60, 98.5	5, 1, 300, 20
		3, 1, 300, 62
CT-Sn(II)@Ti <sub>3</sub> C <sub>2</sub> <sup>[5]</sup>	4, 3, 300, 99.1	3, 3, 300, 35
	4, 4, 500, 98.9	5, 3, 120, 54
	5, 5, 200, 98.8	
	10, 3, 100, 98.5	
MXene-MF <sup>[6]</sup>	8, 8, 270, 99	10, 10, 720, -
	10, 10, 150, -	

[1] S. Wang, Y. Liu, K. Lu, W. Cai, Y. Jie, F. Huang, X. Li, R. Cao, S. Jiao, Engineering rGO/MXene Hybrid Film as an Anode Host for Stable Sodium-Metal Batteries. *Energy Fuels* 2021, 35, 4587-4595.

[2] J. Luo, X. Lu, E. Matios, C. Wang, H. Wang, Y. Zhang, X. Hu, W. Li, Tunable MXene-Derived 1D/2D Hybrid Nanoarchitectures as a Stable Matrix for Dendrite-Free and Ultrahigh Capacity Sodium Metal Anode. *Nano Lett.* 2020, 20, 7700-7708.

[3] X. He, S. Jin, L. Miao, Y. Cai, Y. Hou, H. Li, K. Zhang, Z. Yan, J. Chen, A 3D Hydroxylated MXene/Carbon Nanotubes Composite as a Scaffold for Dendrite-Free Sodium-Metal Electrodes. *Angew. Chem. Int. Ed.* 2020, 59, 16705-16711.

[4] Y. Fang, R. Lian, H. Li, Y. Zhang, Z. Gong, K. Zhu, K. Ye, J. Yan, G. Wang, Y. Gao, Y. Wei, D. Cao, Induction of Planar Sodium Growth on MXene (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>)-Modified Carbon Cloth Hosts for Flexible Sodium Metal Anodes. *ACS Nano.* 2020, 14, 8744-8753.

[5] J. Luo, C. Wang, H. Wang, X. Hu, E. Matios, X. Lu, W. Zhang, X. Tao, W. Li. Pillared MXene with Ultralarge Interlayer Spacing as a Stable Matrix for High Performance Sodium Metal Anodes. *Adv. Funct. Mater.* 2019, 29, 1805946.

[6] H. Shi, M. Yue, C. Zhang, Y. Dong, P. Lu, S. Zheng, H. Huang, J. Chen, P. Wen, Z. Xu, Q. Zheng, X. Li, Y. Yu, Z. Wu, 3D Flexible, Conductive, and Recyclable Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene-Melamine Foam for High-ArealCapacity and Long-Lifetime Alkali-Metal Anode. *ACS Nano* 2020, 14, 8678-8688.