Supporting Information

3D Crinkled MXene/TiO_2 Heterostructure with Interfacial Coupling for Ultra-Fast and Reversible Potassium Storage

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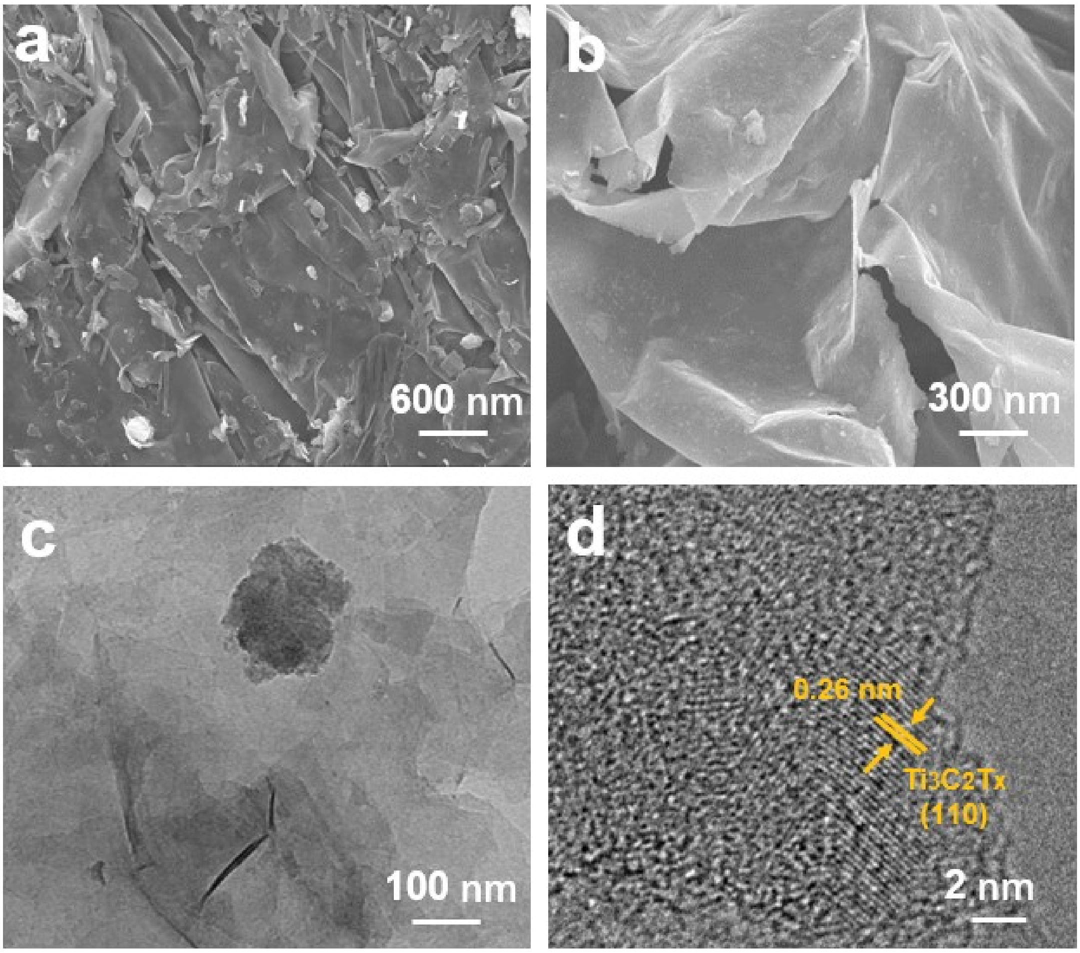

Figure S1 (a)-(b) SEM images, (c) TEM image and (d) HRTEM image of MXene.

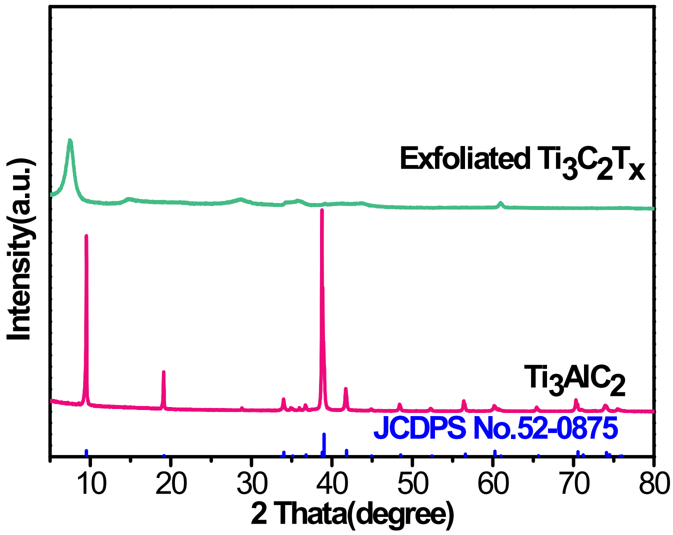

Figure S2 XRD patterns of Ti_3AlC_2 and $Ti_3C_2T_x$ nanosheets.

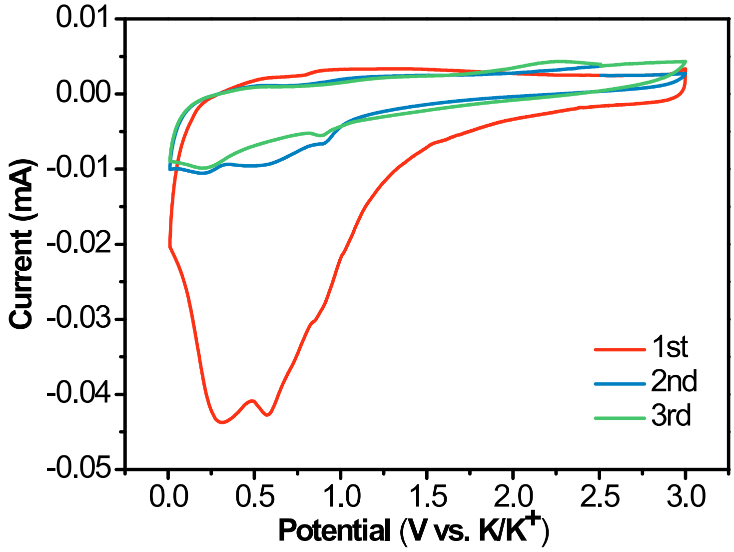

Figure S3 CV curves of CM at a scan rate of 0.1 mV s^{-1}.

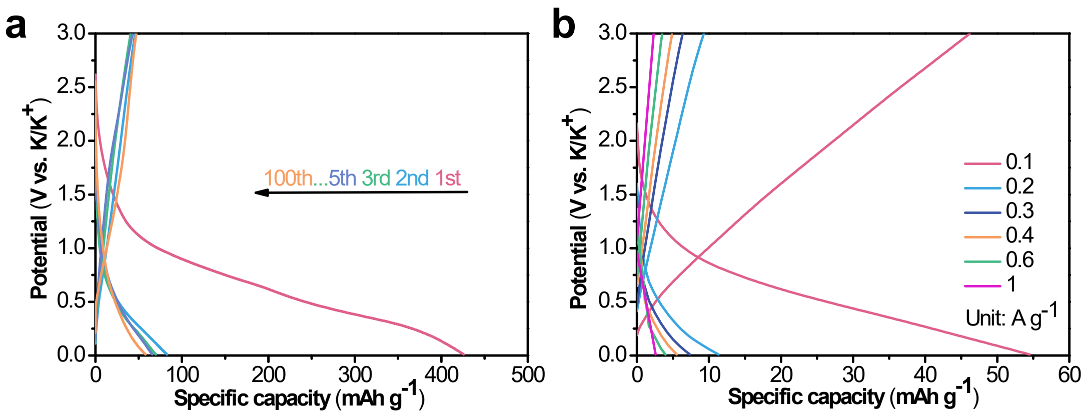

Figure S4 (a) Galvanostatic charge/discharge curves of CM at 0.05 A g^{-1}. (b) The charge/discharge profiles of CM at different current densities.

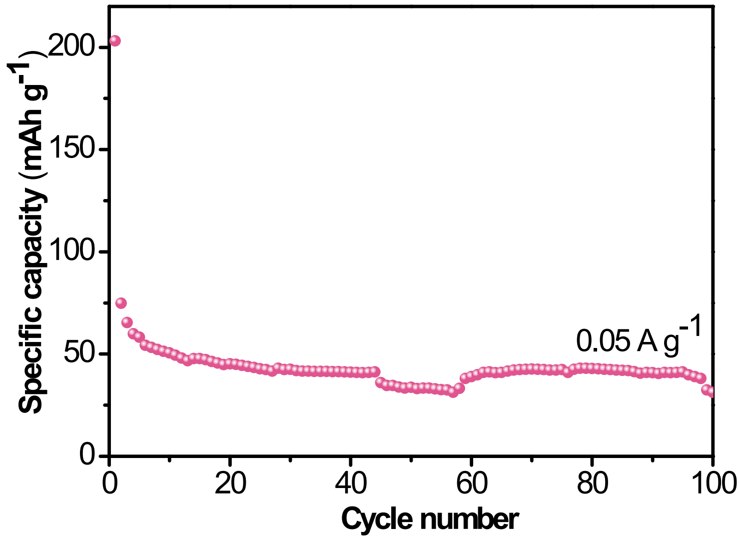

Figure S5 Cycle performance of MXene at 0.05 A g^{-1} over 100 cycles.

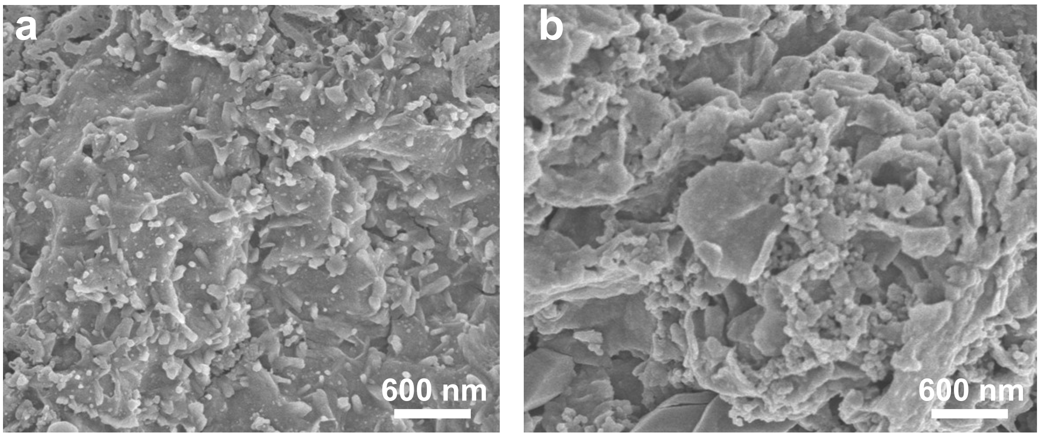

Figure S6 (a) SEM images of CM/TiO_2 after cycle at 0.05 A g^{-1}. (b) SEM images of CM after cycle at 0.05 A g^{-1}.

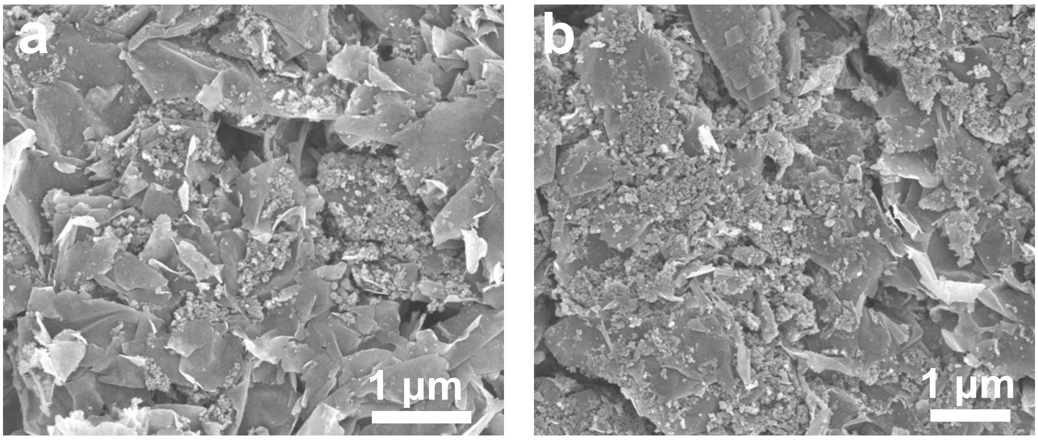

Figure S7 (a) SEM images of CM/TiO_2-3h. (b) SEM images of CM/TiO_2-4h.

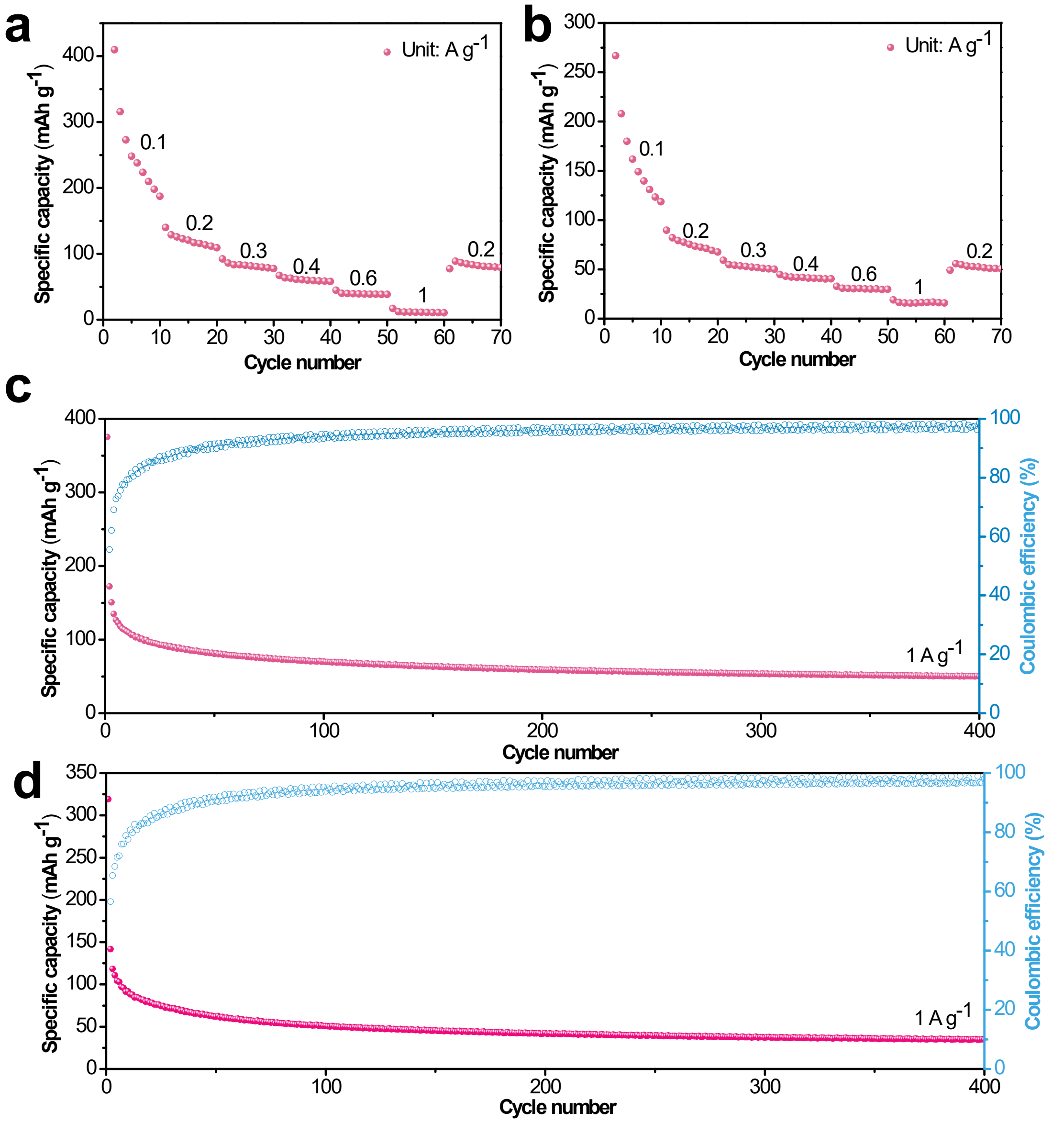

Figure S8 (a) Rate capability of CM/TiO_2-3h at various current densities. (b) Rate capability of CM/TiO_2-4h at various current densities. (c) Long cycle performance of CM/TiO_2-3h at 1 A g^{-1}. (d) Long cycle performance of CM/TiO_2-4h at 1 A g^{-1}.

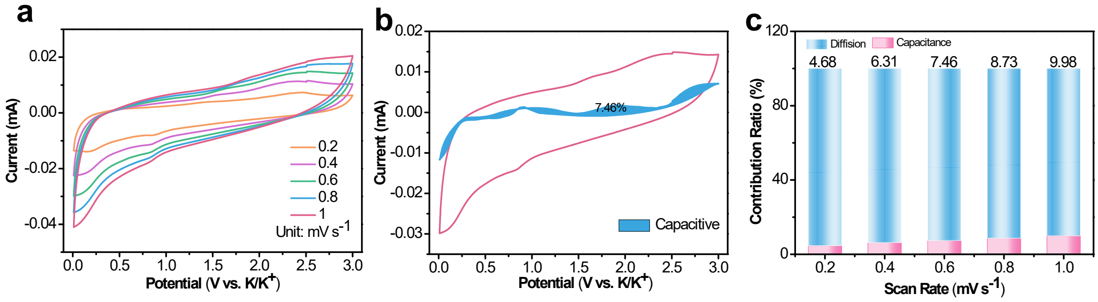

Figure S9 (a) CV profiles of CM at different scan rates from 0.2 to 1.0 mV s^{-1}. (b) Capacitive contribution of CM at 0.6 mV s^{-1}. (c) Normalized contribution ratio of capacitive capacities in CM at various scan rates.

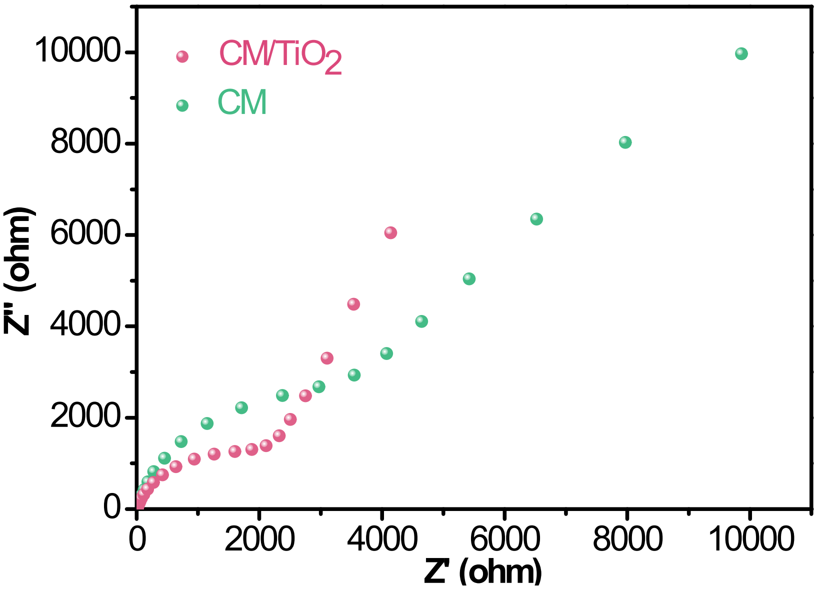

Figure S10 Nyquist plot of CM/TiO_2 and CM after 100 cycles.

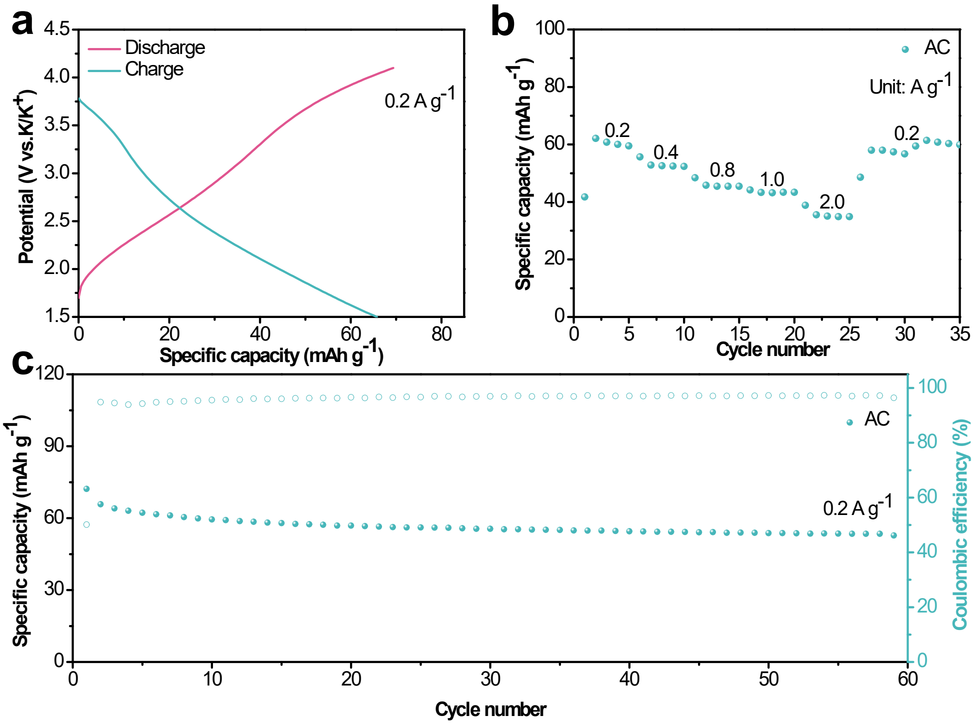

Figure S11 (a) Galvanostatic charge/discharge curves of AC electrode at 0.2 A g^{-1}. (b) Rate capability of AC electrode at various current densities. (c) Cycle performance of AC electrode at 0.2 A g^{-1}.

Table S1. The comparisons of the reported anode for PIBs.

Electrodes	Low rate capacity	High rate capacity	Cycle number
This work	301 mA h g^{-1} (0.1 A g^{-1})	94 mA h g^{-1} (0.4 A g^{-1})	150 mA h g^{-1} (0.05 A g^{-1}, 100 cycles)
Ti_3CN[1]	181 mA h g^{-1} (0.02 A g^{-1})	80 mA h g^{-1} (0.5 A g^{-1})	60 mA h g^{-1} (0.1 A g^{-1}, 100 cycles)
f-MXene[2]	119 mA h g^{-1} (0.08 A g^{-1})	80 mA h g^{-1} (0.5 A g^{-1})	120 mA h g^{-1} (0.1 A g^{-1}, 200 cycles)
a-$Ti_3C_2T_x$[3]	167 mA h g^{-1} (0.08 A g^{-1})	90 mA h g^{-1} (0.2 A g^{-1})	50 mA h g^{-1} (0.1 A g^{-1}, 120 cycles)
Ti_3C_2[4]	119 mA h g^{-1} (0.01 A g^{-1})	57 mA h g^{-1} (0.5 A g^{-1})	30 mA h g^{-1} (0.2 A g^{-1}, 500 cycles)
h-MXene[2]	69 mA h g^{-1} (0.08 A g^{-1})	39 mA h g^{-1} (0.5 A g^{-1})	100 mA h g^{-1} (0.1 A g^{-1}, 200 cycles)
MXene Ti_3C_2[5]	105 mA h g^{-1} (0.06 A g^{-1})	20 mA h g^{-1} (0.5 A g^{-1})	80 mA h g^{-1} (0.05 A g^{-1}, 100 cycles)
N-UT-$Ti_3C_2T_x$[6]	166 mA h g^{-1} (0.09 A g^{-1})	141 mA h g^{-1} (0.3 A g^{-1})	100 mA h g^{-1} (0.1 A g^{-1}, 100 cycles)

Reference

[1] J. Zhu, M. Wang, M. Lyu, Y. Jiao, A. Du, B. Luo, I. Gentle, L. Wang, Two-Dimensional Titanium Carbonitride Mxene for High-Performance Sodium Ion Batteries, ACS Applied Nano Materials 1(12) (2018) 6854-6863.
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[6] Y. Zhao, G. Dong, M. Zhang, D. Wang, Y. Chen, D. Cao, K. Zhu, G. Chen, Surface-engineered $Ti_3C_2T_X$ MXene enabling rapid sodium/potassium ion storage, 2D Materials 10(1) (2022).