Supporting information

Enhancing Ion Storage and Transport in $Ti_3C_2T_z$ MXene via a "Sacrificial Cations" Strategy

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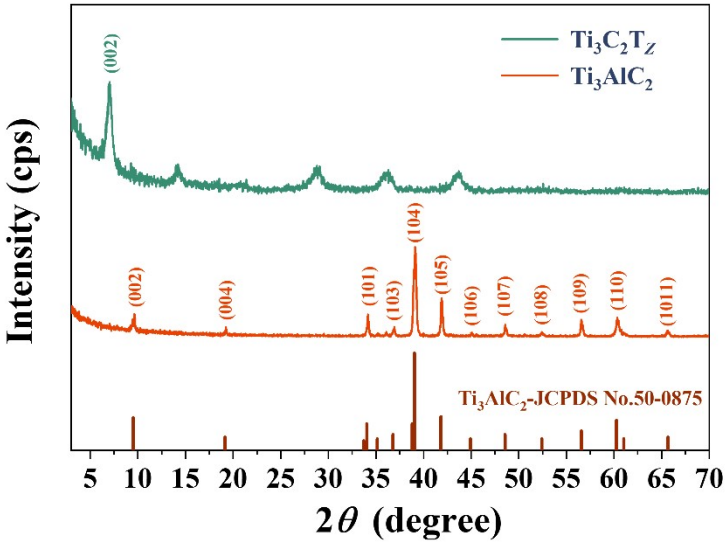

Figure S1 XRD patterns of $Ti_3C_2T_z$ and Ti_3AlC_2.

Figure S2 The Tyndall effect of $Ti_3C_2T_z$ suspension.

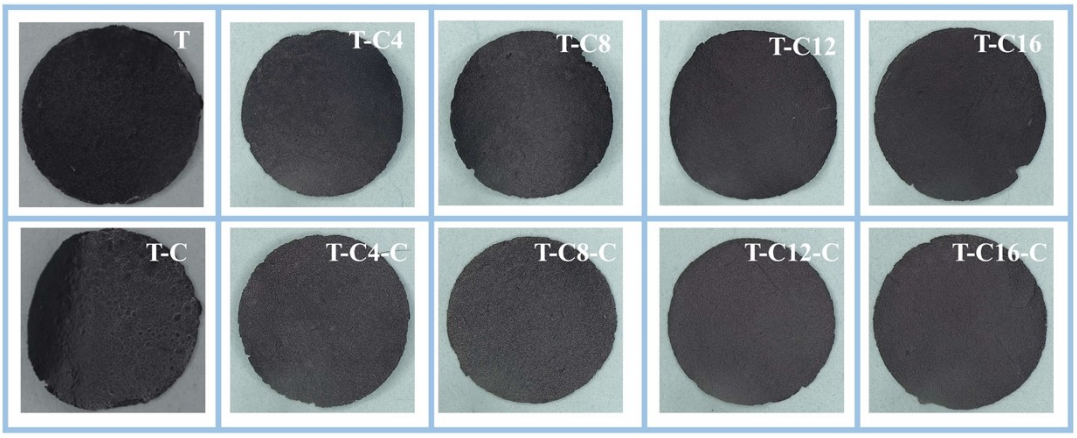

Figure S3 Optical microscope images of T, T-C, T-C*X*, and T-C*X*-C.

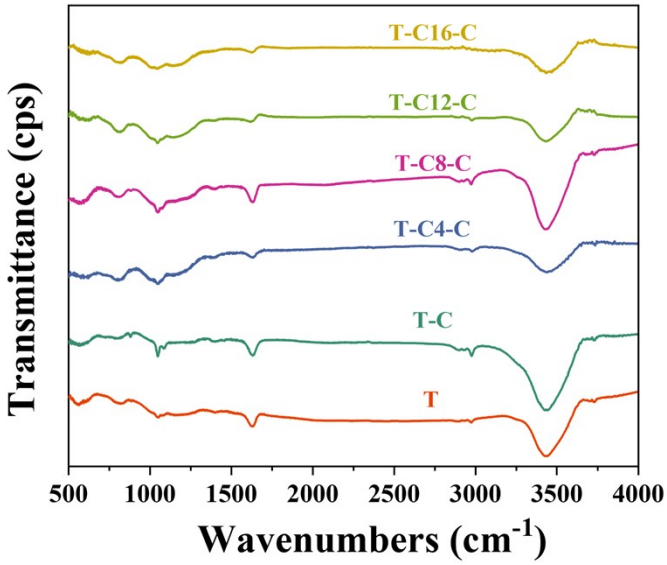

Figure S4 Fourier-transform infrared spectroscopy (FTIR) spectra of T, T-C, and T-C*X*-C.

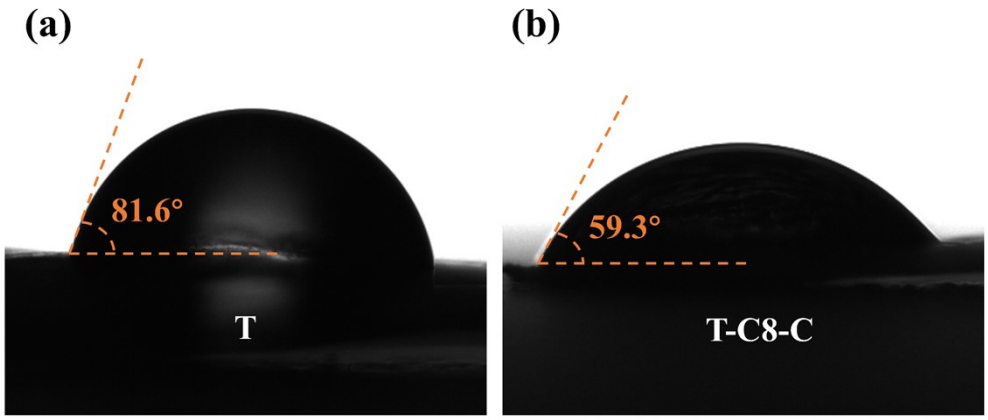

Figure S5 The contact angles of T (a) and T-C8-C (b).

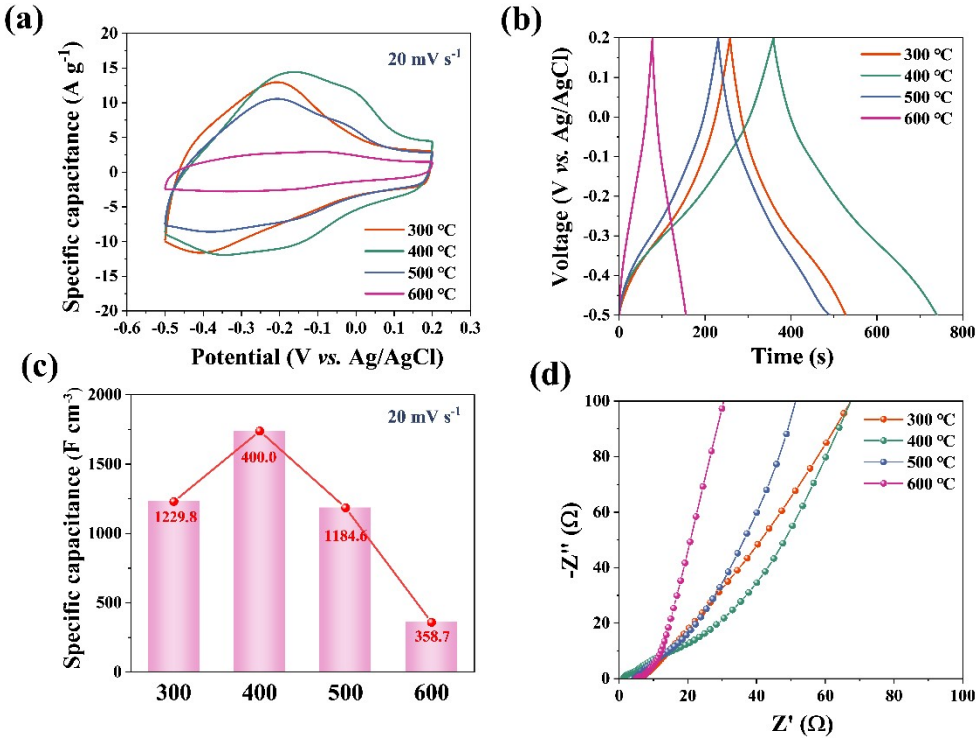

Figure S6 (a)-(b) CV and GCD curves of T-C8-C films at 300, 400, 500, and 600 °C. (c) Specific capacitances of T-C8-C films at 300, 400, 500, and 600 °C at 20 mV s^{-1}. (d) EIS curves of T-C8-C films reacted at 300, 400, 500, and 600 °C.

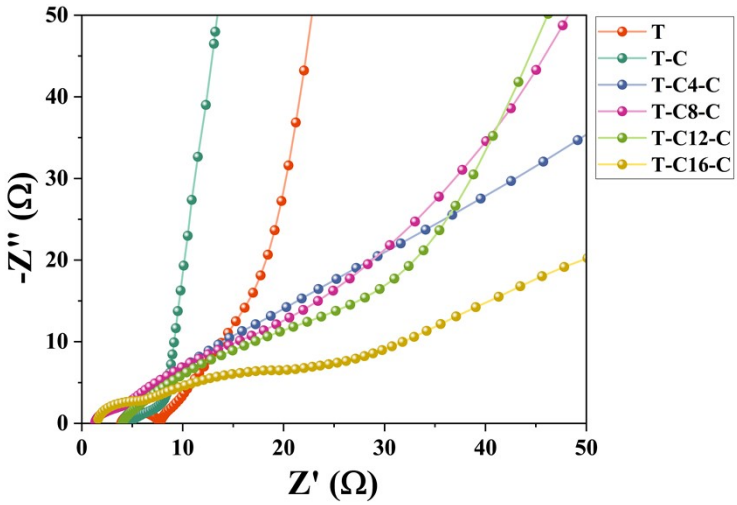

Figure S7 Nyquist plots of the T, T-C, and T-C*X*-C electrodes.

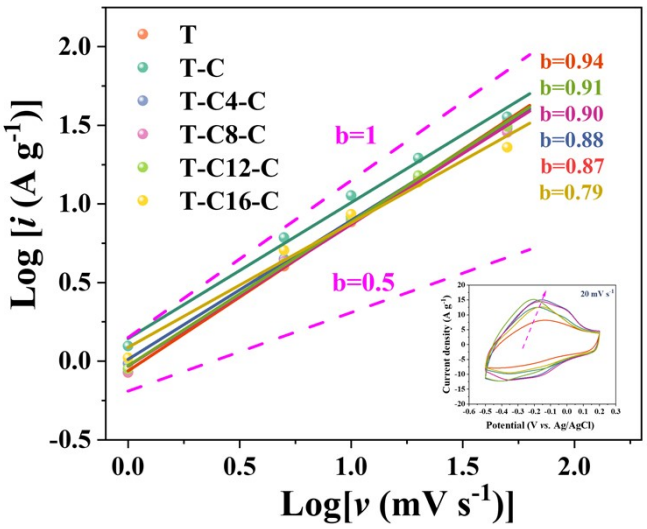

Figure S8 The *b* values are estimated by fitting the data for T, T-C, and T-C*X*-C electrodes.

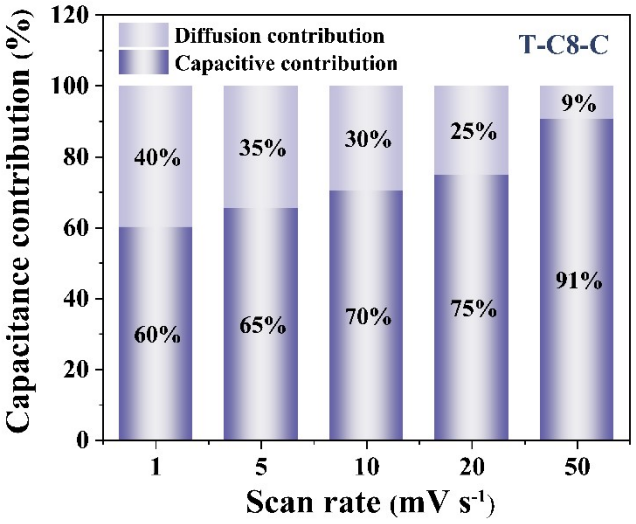

Figure S9 CV partition analysis shows the capacitive contribution to the total current at selected scan rates of T-C8-C.

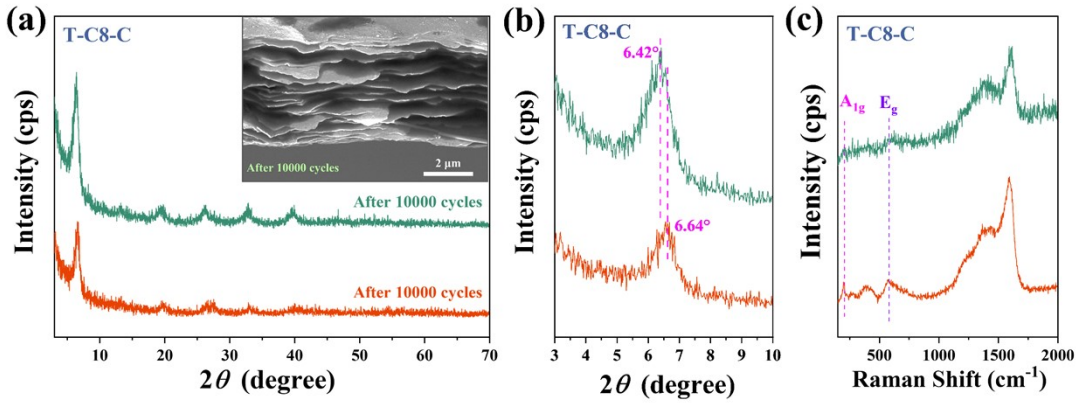

Figure S10 (a)-(b) XRD patterns of T-C8-C before and after 10000 cycles (insets show SEM image of T-C8-C after 10000 cycles) and the magnified patterns of (002) peak. (c) Raman spectra of T-C8-C before and after 10000 cycles.

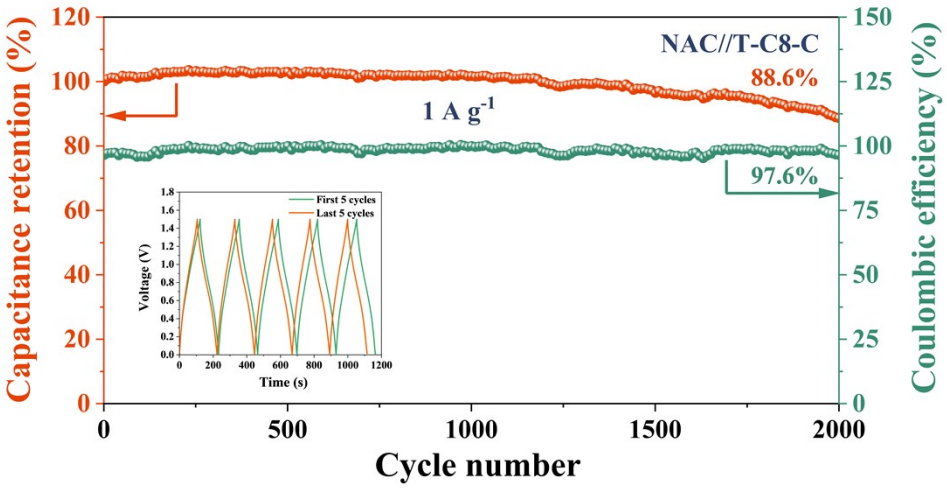

Figure S11 Cycling performance of T-C8-C//NAC at a current density 1 A g^{-1} for 2000 cycles (inset shows GCD curves of the first and last 5 cycles).

Table S1. Comparative study of MXene-based electrode materials for specific capacitance.

Electrode material	Electrolyte	Specific capacitance for single-electrode	Cycle stability	Ref
T-C8-C	3 M H_2SO_4	1737.6 F cm^{-3} at 1 A g^{-1}	102.8% for 10000 cycles	Our work
S-etched $Ti_3C_2T_x$ films	3 M H_2SO_4	1200.0 F cm^{-3} at 5 mV s^{-1}	99.3% for 10000 cycles	1
COF@N-$Ti_3C_2T_x$ /DPA	PVA/H_2SO_4	1298.3 F cm^{-3} at 1 A cm^{-3}	82.6% for 20000 cycles	2
PPy@BC/$Ti_3C_2T_x$	3 M H_2SO_4	550.0 F g^{-1} at 5 mV s^{-1}	83.5% for 10000 cycles	3
MXene/AuNPs	1 M H_2SO_4	278.0 F g^{-1} at 5 mV s^{-1}	95.0% for 10000 cycles	4
$Ti_3C_2T_x$–K_2SO_4–C	1 M H_2SO_4	380.0 F g^{-1} at 2 mV s^{-1}	90.0% for 10000 cycles	5
$MXene_{0.9}$	1 M H_2SO_4	318.5 F g^{-1} at 1 A g^{-1}	92.0% for 10000 cycles	6
SNMG-40	1 M H_2SO_4	698.5 F cm^{-3} at 1 A g^{-1}	97.8% for 30000 cycles	7
Fe_2O_3/MXene aerogel	3 M H_2SO_4	182.0 F g^{-1} at 1 A g^{-1}	81.5 % for 10000 cycles	8
$Ti_3C_2T_x$–Mn	3 M H_2SO_4	369.0 F g^{-1} at 2 mV s^{-1}	87.4% for 5000 cycles	9
Ti_3C_2 FIBER	1 M H_2SO_4	309.0 F g^{-1} at 1 A g^{-1}	97.2% for 10000 cycles	10

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