Supporting information

Dual Functional Ti$_3$C$_2$T$_x$ MXene for Wastewater Treatment and Electrochemical Energy Storage

Xingxing Zhu$^a$, Xinhua Huang$^{a,d,*}$, Ruikun Zhao$^b$, Kin Liao$^c$, Vincent Chan$^{d,*}$

$^a$School of Materials Science and Engineering, Anhui University of Science and Technology, Huainan, Anhui, 232001, P. R. China.

Email: xhhuang@aust.edu.cn

$^b$College of Arts and Sciences, Khalifa University of Science and Technology, PO Box 127788, Abu Dhabi, UAE.

$^c$Department of Aerospace Engineering, Khalifa University of Science and Technology, PO Box 127788, Abu Dhabi, UAE.

$^d$Department of Biomedical Engineering, Khalifa University of Science and Technology, PO Box 127788, Abu Dhabi, UAE.
Figure S1. The full XRD spectrum of all samples.
**Figure S2** (a) IR transmission spectra of all samples at room temperature in KBr wafer. (b) Raman spectra of TC-600, TMO-600, TMB-600, TR-600, and Ti3C2Tx-600.

**Figure S3** SEM images of purity Ti$_3$C$_2$Tx (a) and (b) Ti$_3$C$_2$Tx treated by RhB.
Figure S4 Three electrode (a) GCD curves of the TRhB-600 electrode at current densities of 1, 2, 3, 5 and 10 A g\(^{-1}\), respectively. (b) CV curves of the TRhB-600 electrode at scan rates of 5, 10, 20, 50, 100 and 200 mV s\(^{-1}\).
Figure S5 6 M KOH as electrolyte in two-electrode system (a) GCD curves of TRhB-600 electrode at various current density; (b) CV curves of TRhB-600 electrode at various scanning rates; (c) EIS for TRhB-600 electrode; (d) Ragone plot of TRhB-600 electrode; (e) Rate performance of TRhB-600 electrode as a function of scan rate; and (f) cycling stability of TRhB-600 at 3 A g\(^{-1}\) over 8000 cycles.
Figure S6 (a) TRhB-600 inverse of stored charge (q) versus square root of the scan rate (v). (b) TRhB-600 stored charge versus inverse of the square root of the scan rate. (c) Normalized real and imaginary capacitances of Ti$_3$C$_2$Tx-600 electrode. (d) Normalized real and imaginary capacitances of TRhB-600 electrode. (e) Linear fit showing the relationship between $Z'$ and $\omega^{-1/2}$ in the low-frequency region of Ti$_3$C$_2$Tx-600 and TRhB-600.