

## Supporting Information

# Hierarchical Vertically Aligned Titanium Carbide (MXene) Array for Flexible All-Solid-State Supercapacitor with High Volumetric Capacitance

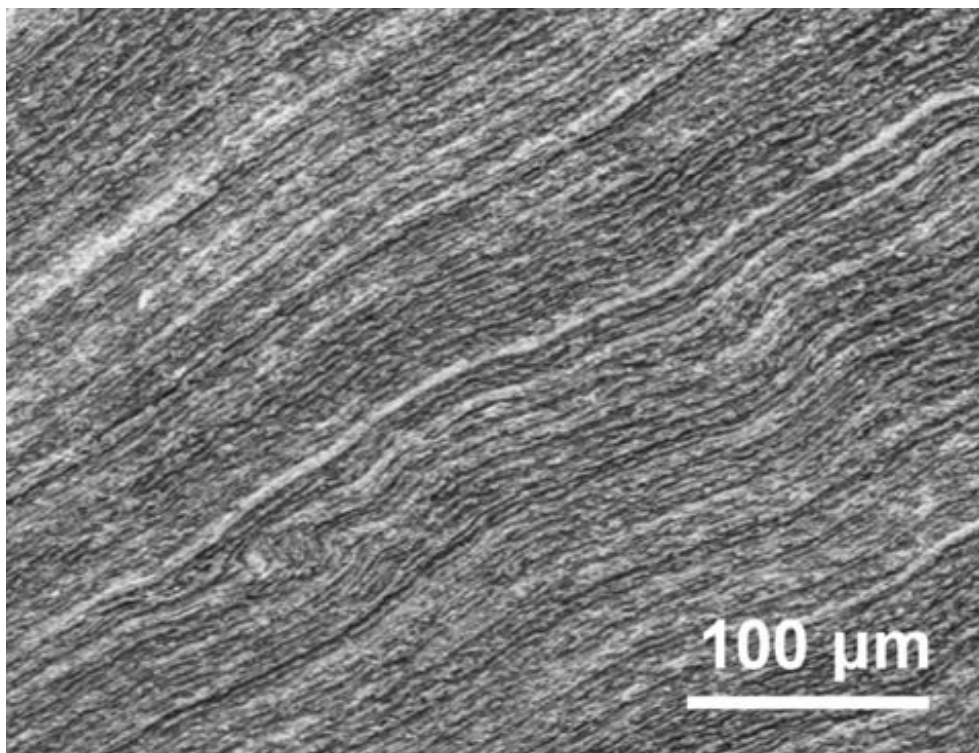
*Qian Pan,<sup>†,‡,#</sup> Chunyang Duan,<sup>†,#</sup> Hongying Liu,<sup>‡</sup> Mengqi Li,<sup>†</sup> Zenghua Zhao,<sup>†</sup> Dong Zhao,<sup>†</sup> Yuda Duan,<sup>‡</sup> Yunfa Chen,<sup>†</sup> Yu Wang<sup>\*,†</sup>*

<sup>†</sup> State Key Laboratory of Multiphase Complex Systems, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, P. R. China

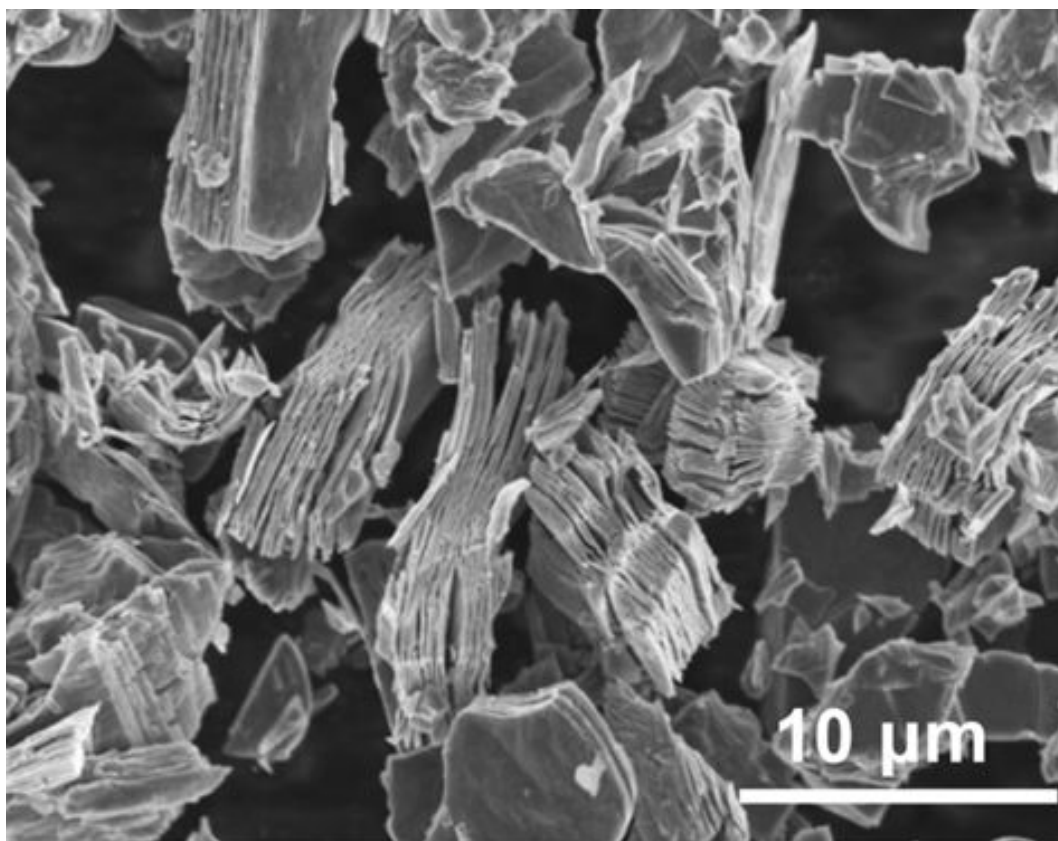
<sup>‡</sup> School of Chemical and Environmental Engineering, China University of Mining and Technology (Beijing), Beijing 100083, P. R. China

<sup>#</sup> Qian Pan and Chunyang Duan contributed equally to this work.

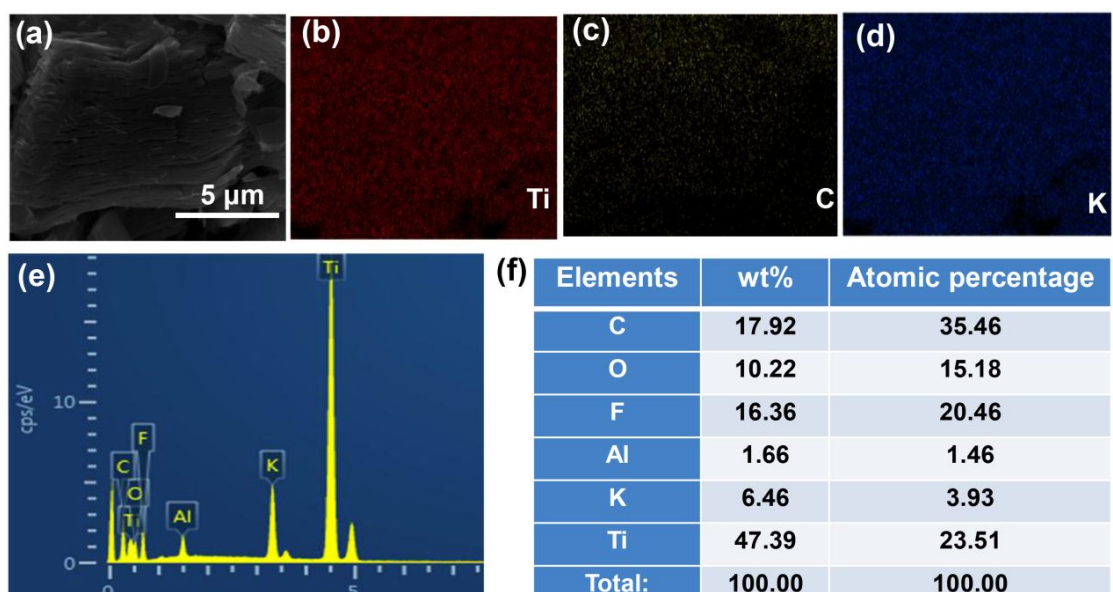
<sup>\*</sup> Corresponding author: wyu@ipe.ac.cn.



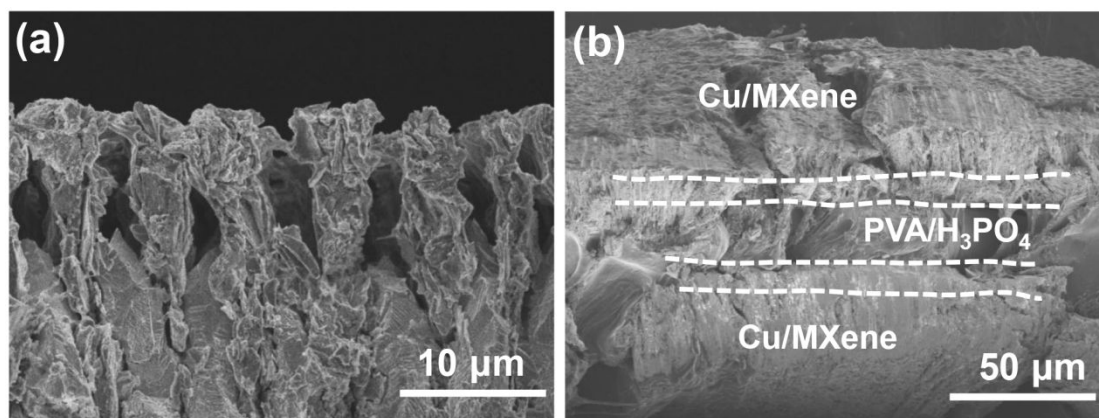
**Figure S1. SEM image of hierarchical MXene array structure.**



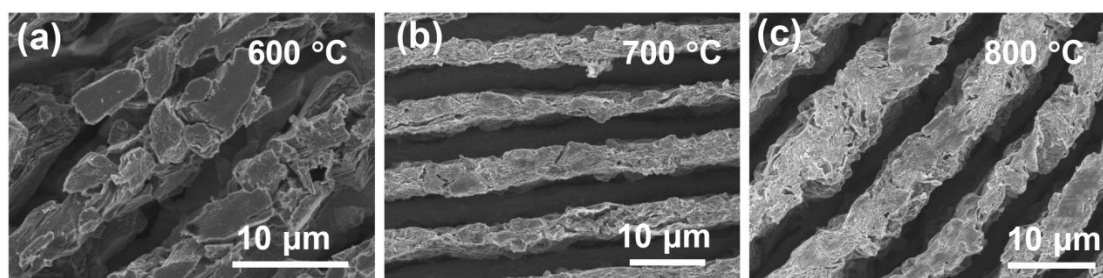
**Figure S2. SEM image of MXene (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>) particles.**



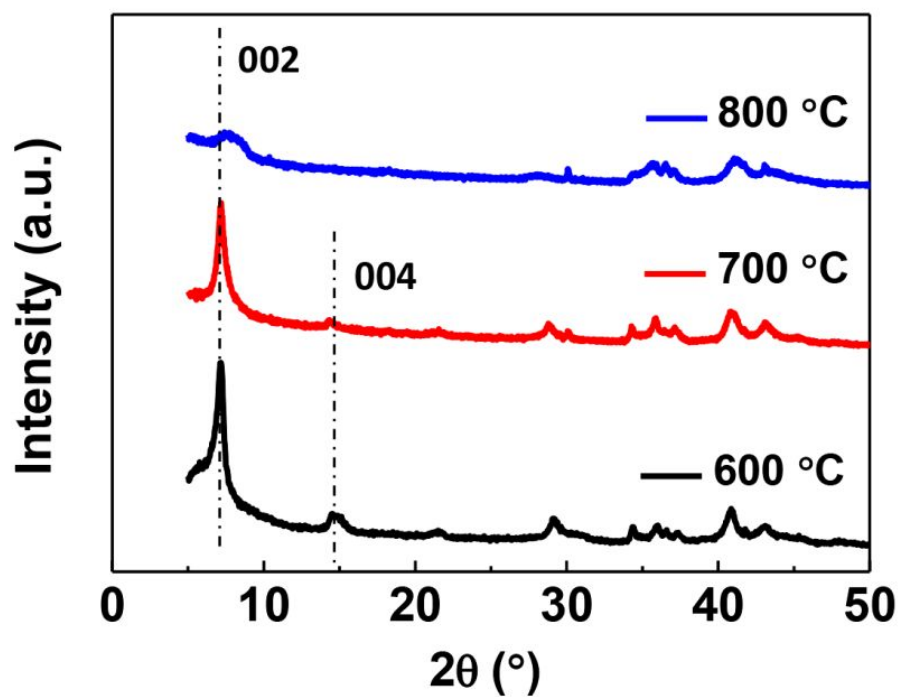
**Figure S3. Energy-dispersive spectroscopy (EDS) results of  $K^+$  intercalated MXene. (a) SEM image of MXene particle. Ti (b), C (c), K (d) distribution of the MXene particle shown in (a). Energy dispersive spectral (e) and atomic percentage (f) of the MXene sample.**



**Figure S4. Cross-sectional SEM images of hierarchical MXene array (a), and ASSSs based on MXene array (b).**



**Figure S5. Top-viewed SEM images (a-c) of MXene arrays that were fabricated with different hot-pressing temperatures (600, 700 and 800 °C).**



**Figure S6.** XRD patterns of MXene arrays that were fabricated under different hot-pressing temperatures (600, 700 and 800 °C).

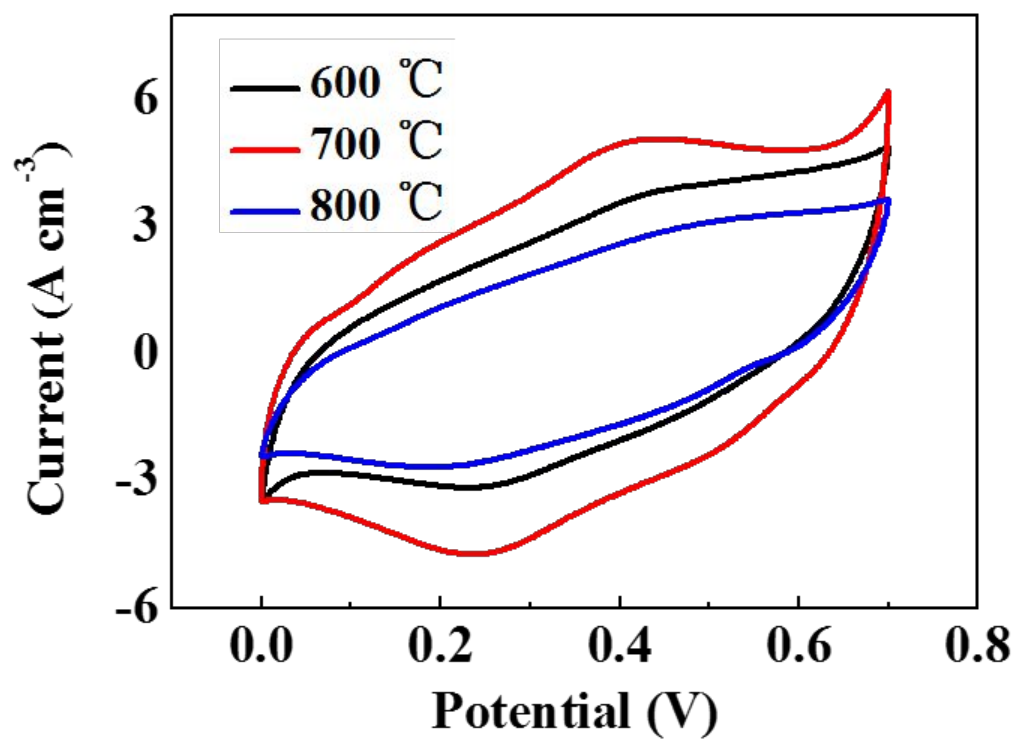
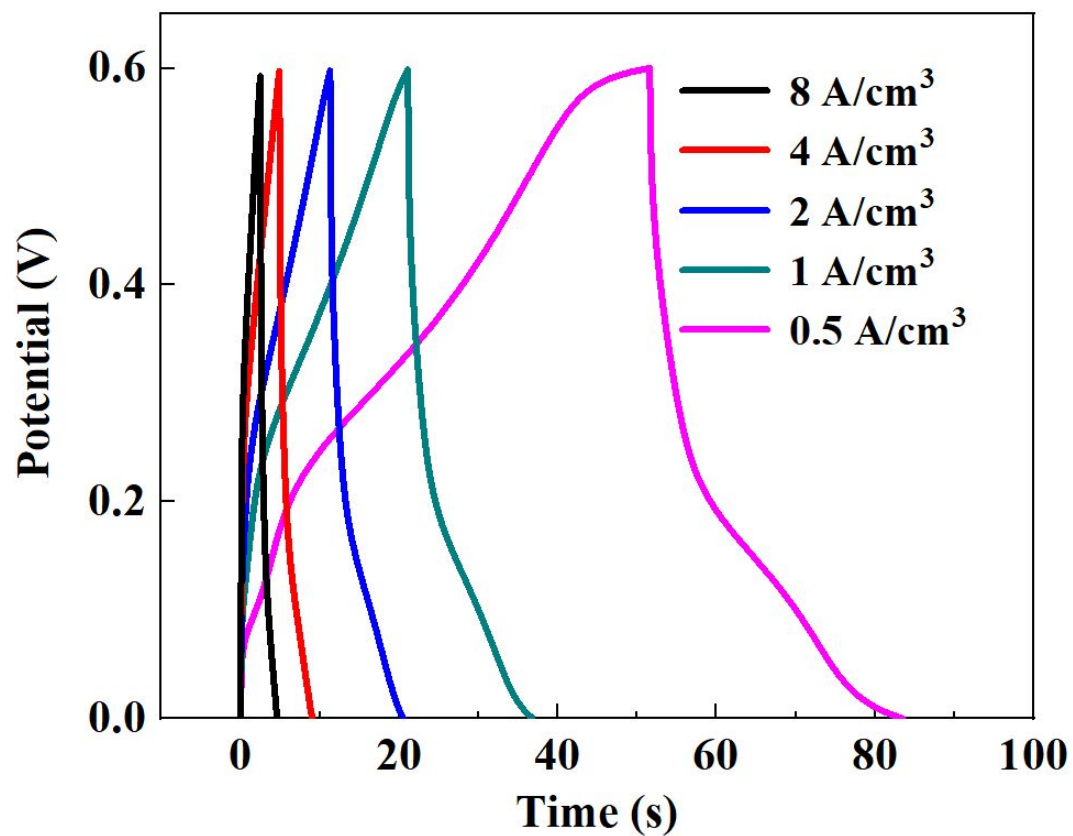


Figure S7. CV curves of MXene arrays that were fabricated at different hot-pressing temperatures (600, 700 and 800 °C).





**Figure S8.** GCD curves of ASSSs based on PVA/H<sub>2</sub>SO<sub>4</sub> gel measured at different current densities of 0.5, 1, 2, 4, and 8 A cm<sup>-3</sup>

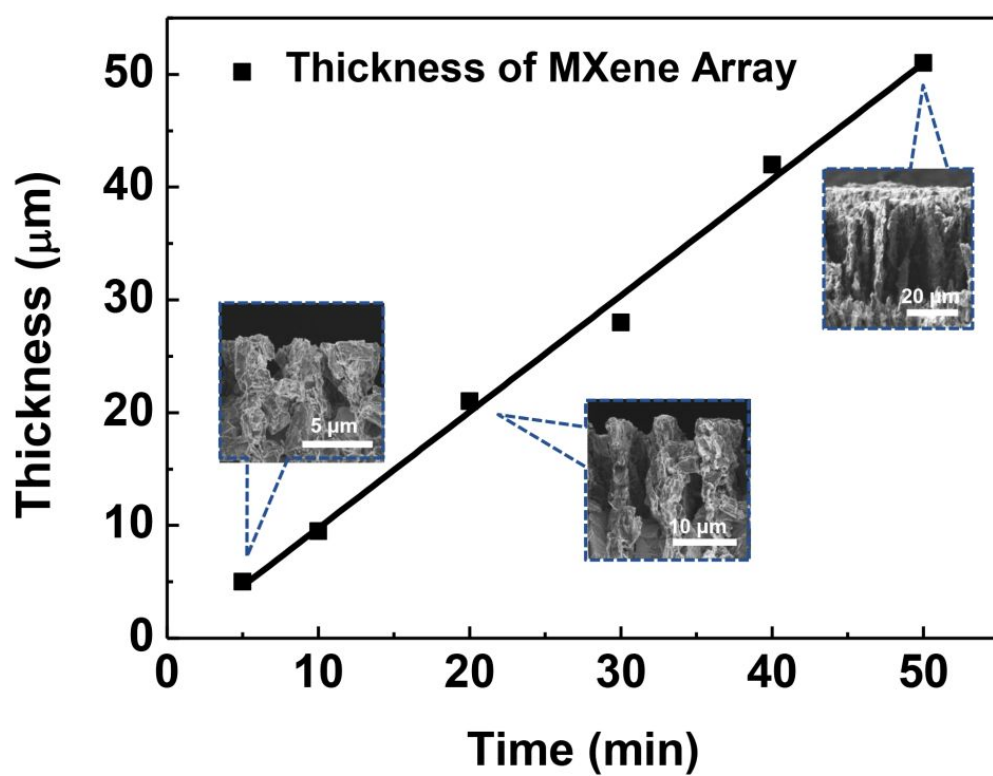
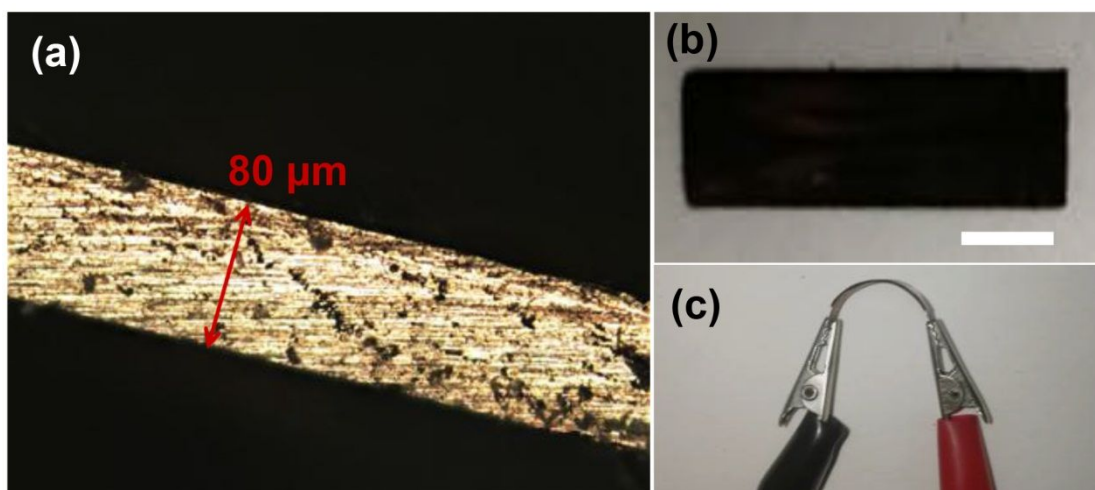
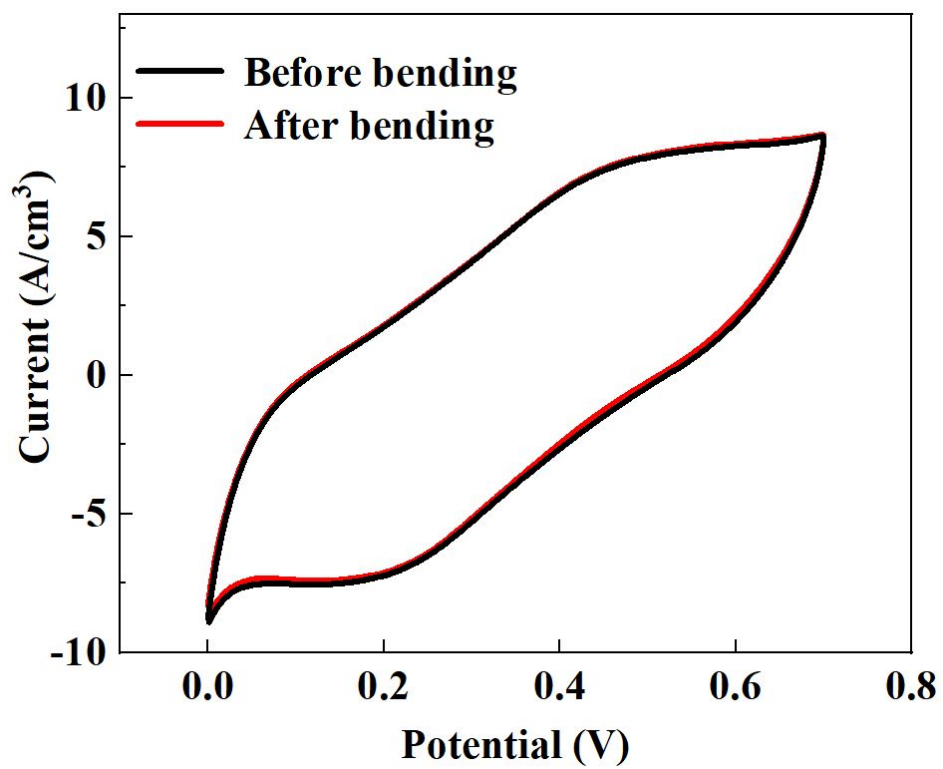


Figure S9. Thicknesses of MXene array at different etching time.



**Figure S10. (a) Microscopic photograph of the cross-sectional of flexible Cu/MXene composite with the thickness of 80 μm. (b) Top-viewed photograph of flexible MXene array. (c) Photograph of a flexible ASSS based on MXene array that was in testing. Scale bar: 5mm.**



**Figure S11. CV curves of flexible ASSSs in bent and flat states after bending for 100 cycles (20 mV s<sup>-1</sup>).**