Supporting Information for

# MXene Enhanced 3D Needled Waste Denim Felt for High-Performance Flexible Supercapacitors

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## Supplementary Figures and Tables

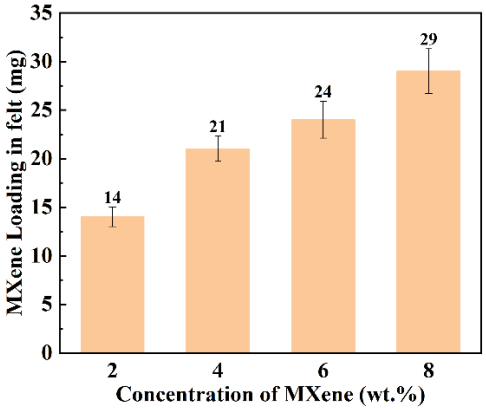


**Fig. S1** Load amounts of MXene of DF after dipping different concentrations of MXene aqueous solution

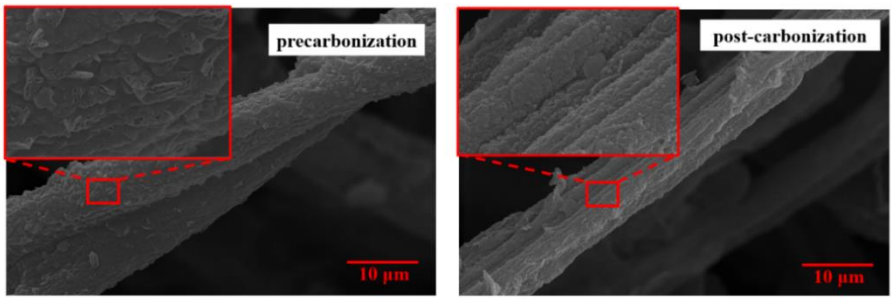


**Fig. S2** MXene morphology on DF before and after carbonization

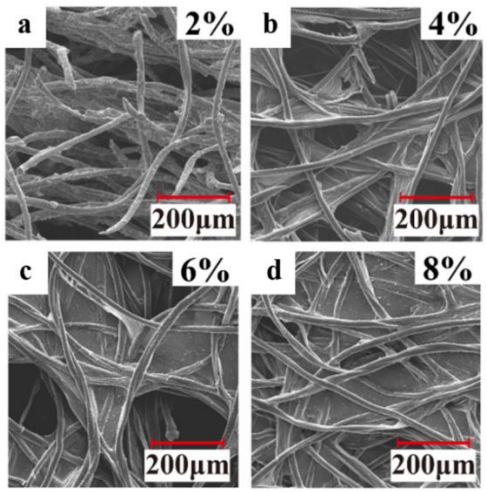


**Fig. S3** SEM images of MDF impregnated from different MXene concentrations: (**a**) 2 wt.%, (**b**) 4 wt.%, (**c**) 6 wt.%, and (**d**) 8 wt.%, respectively

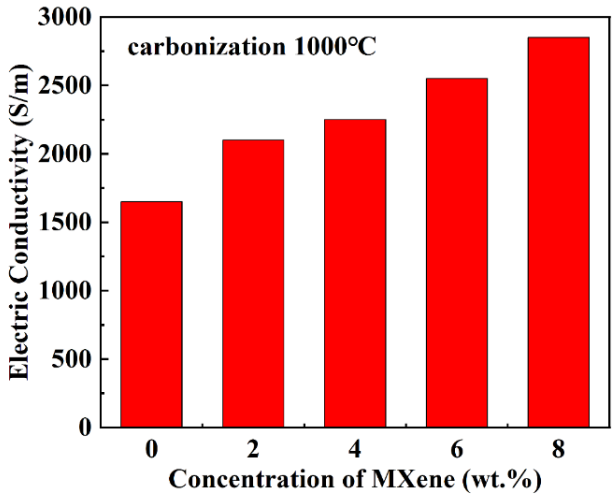


**Fig. S4** Electrical conductivity of CMDF impregnated from different MXene concentrations

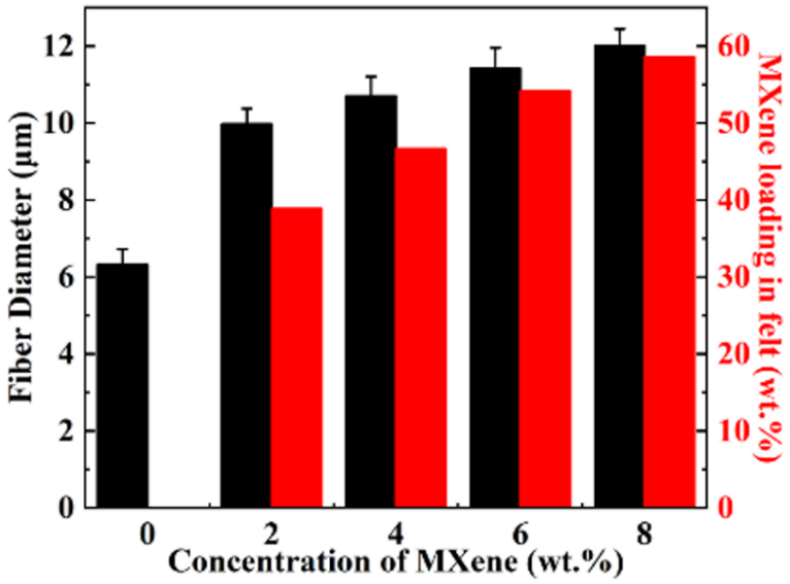


**Fig. S5** Histogram of fiber diameter and MXene load in MDF impregnated from different MXene concentrations

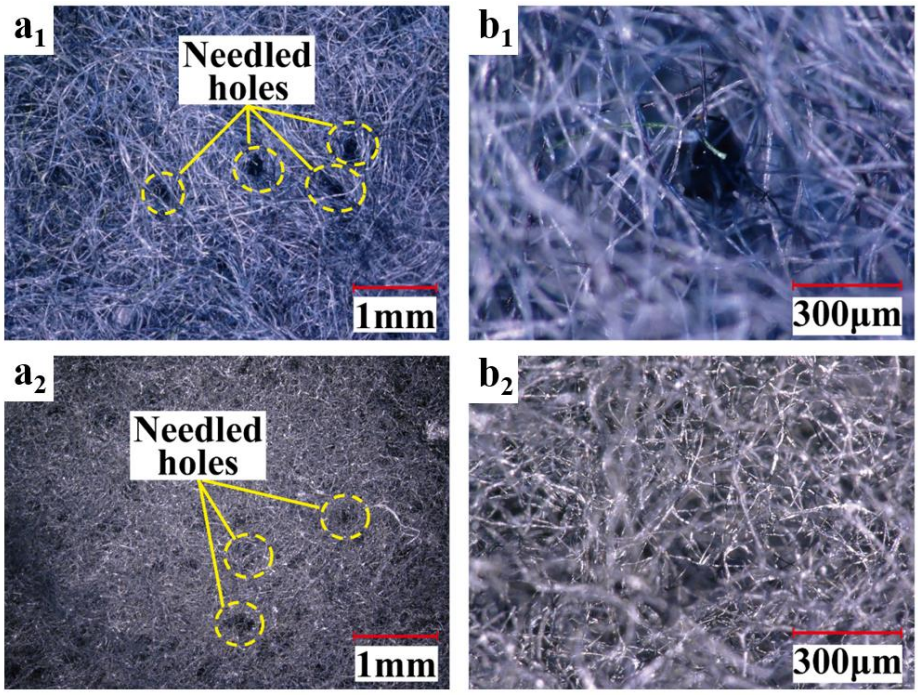


**Fig. S6** SEM images of the DF at (**a**$_1$) low resolution and (**b**$_1$) high resolution; SEM images of the CDF at (**a**$_2$) low resolution and (**b**$_2$) high resolution

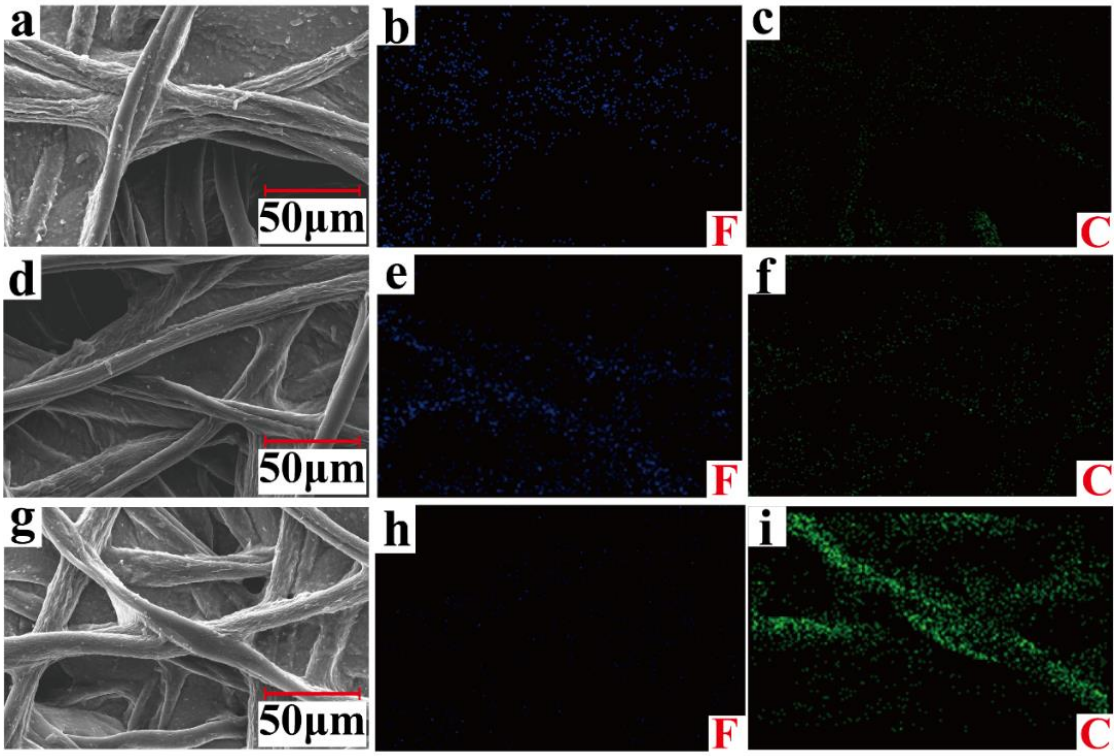


**Fig. S7** EDX mapping results of CMDF at different carbonization temperatures: (**a- c**) 800 ℃, (**d-f**) 1000 ℃, (**g-i**) 1200 ℃

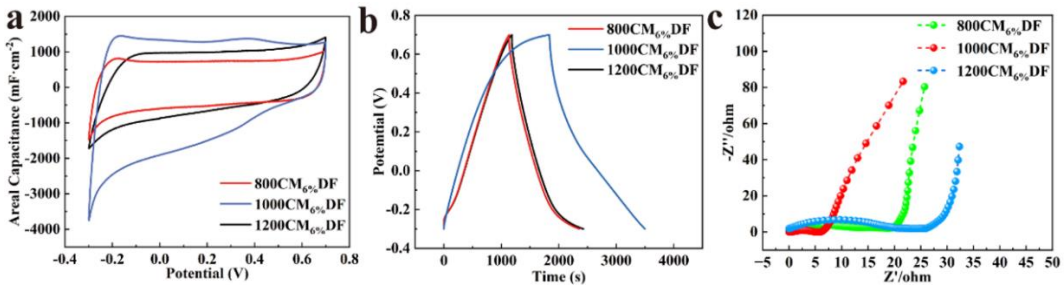


**Fig. S8** (**a**) CV curves, (**b**) GCD curves and (**c**) EIS spectra of CMDF at different carbonization temperatures

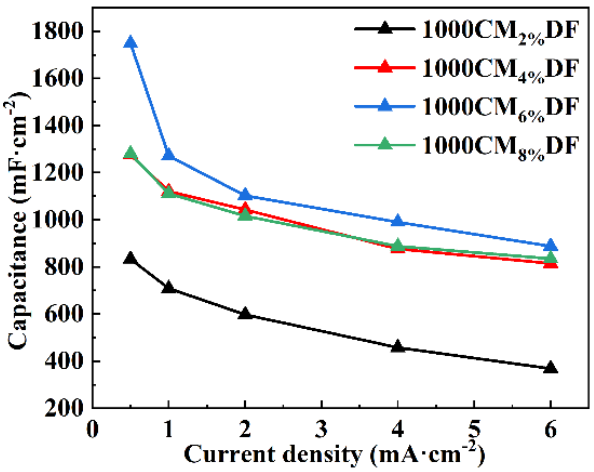


**Fig. S9** The electrochemical performance of CMDF with different MXene loadings

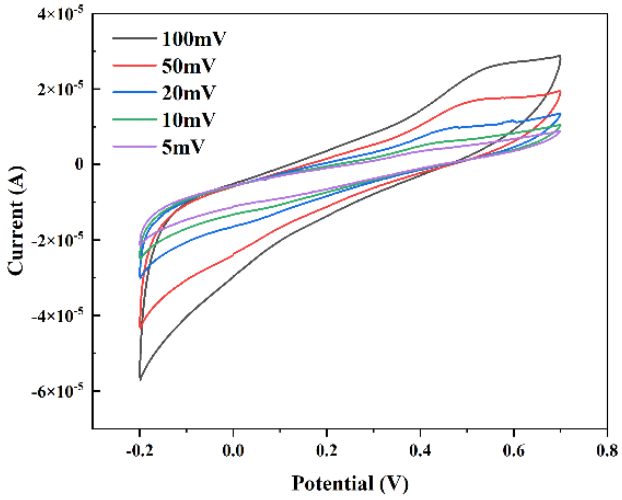


**Fig. S10** CV plot of the supercapacitor assembled by CDF

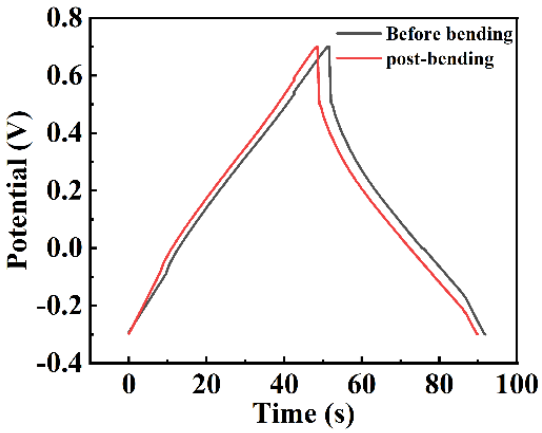


**Fig. S11** GCD of the supercapacitor before and after 1000 cycles bending with 180 degress

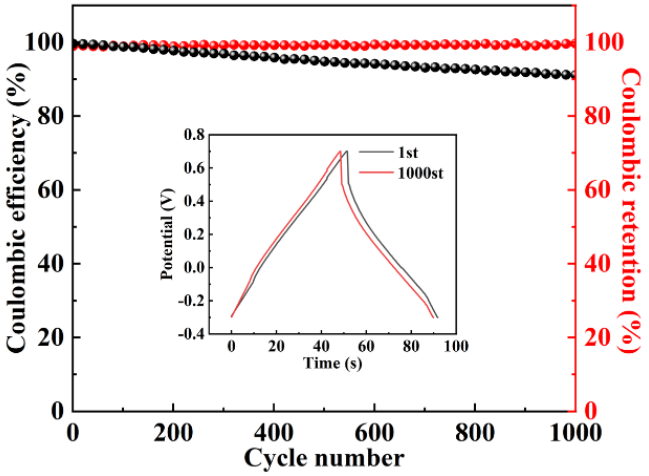


**Fig. S12** GCD of the supercapacitor before and after folding for 1000 cycles

**Table S1** Comparison of mass loading with other relevant works

| Active materials | Substrate | Mass loading | Refs. |
|---|---|---|---|
| MXene | Silk-derived carbon cloth | 2 mg $cm^{-2}$ | [S1] |
| MXene | Silver-plated nylon fiber | 0.8 mg $cm^{-1}$ | [S2] |
| MXene | Cellulose Yarns | 2.2 mg $cm^{-1}$ | [S3] |
| MXene | Cotton yarn | 0.62 mg $cm^{-1}$ | [S4] |
| MXene | Cotton fabric | 3 mg $cm^{-2}$ | [S5] |
| MXene | denim waste fiber needle felts | 30 mg $cm^{-2}$ | This work |
| MXene | / | 12 mF $cm^{-2}$ | [1] |
| MXene | / | 182 F $g^{-1}$ | [2] |
| MXene | / | 34.87 mF$cm^{-2}$ | [3] |

## Supplementary References


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