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Multifunctional PCL/MXene ultrafine fiber scaffolds with tunable topology and photothermal response

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Running title: PCL/MXene photothermal fiber scaffold

Supplementary File

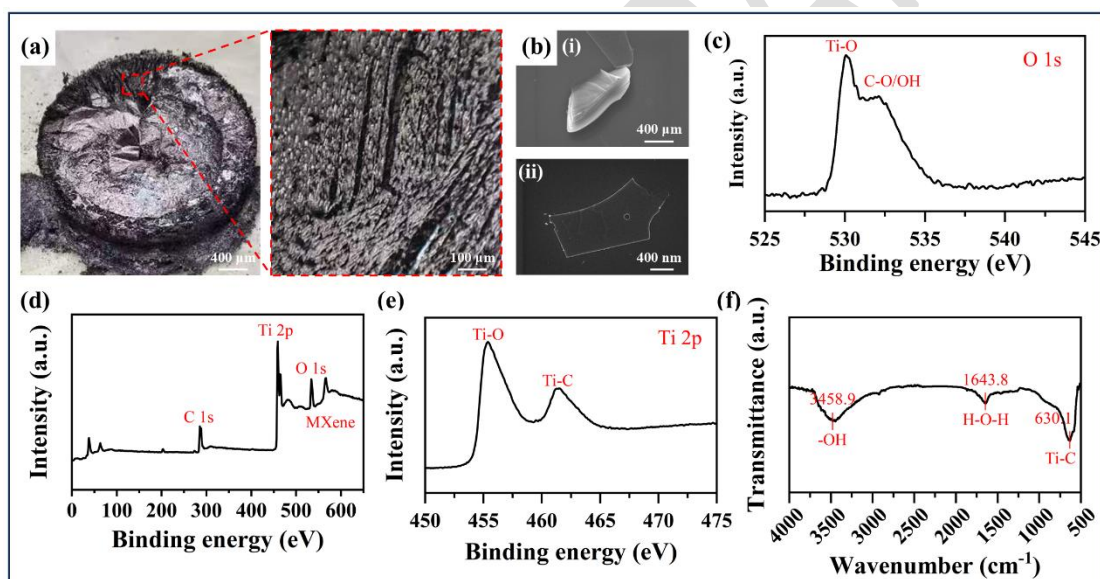


Figure S1. (a) Photograph of the as-prepared MXene and its magnified view; (b) SEM images of $\text{Ti}_3\text{C}_2\text{T}_x$ after HF/HCl etching: (i) multilayered MXene, (ii) monolayer MXene; (c) O 1s spectrum; (d) XPS survey spectrum; (e) Ti 2p spectrum; (f) FTIR spectrum.

Table S1. Influence of printing temperature on fiber forming.

Temperature (°C)	Fiber Diameter (μm)	Jet Stability
90	/	Discontinuity
100	43.8 $\pm$ 2.5	Stable
110	50.2 $\pm$ 2.1	Stable
120	58.6 $\pm$ 3.4	Stable
130	63.5 $\pm$ 12.8	Unstable

Table S2. Influence of pneumatic pressure on fiber forming.

Air Pressure (kPa)	Fiber Diameter (μm)	Jet Stability
40	35.2 $\pm$ 7.2	Unstable
50	43.8 $\pm$ 2.5	Stable
60	50.5 $\pm$ 2.2	Stable
70	56.3 $\pm$ 3.1	Stable
80	64.8 $\pm$ 5.2	Stable

Table S3. Influence of printing speed on fiber forming.

Printing Speed (mm/min)	Fiber Diameter (μm)	Jet Stability
800	68.5 $\pm$ 4.2	Discontinuity
1000	58.2 $\pm$ 3.5	Stable
1200	50.4 $\pm$ 2.4	Stable
1400	43.6 $\pm$ 3.0	Stable
1600	/	Discontinuity

Table S4. Orthogonal experimental results of 4 wt% PCL/MXene ink.

Experiment No.	A	B	C	Fiber Diameter(μm)
1	1(100°C)	1(50 kPa)	1 (1000 mm/min)	61.5
2	1	2(60 kPa)	2 (1200 mm/min)	54.2
3	1	3(70 kPa)	3 (1400 mm/min)	48.6
4	2(110°C)	1	2	51.8
5	2	2	3	46.3
6	2	3	1	56.5
7	3(120°C)	1	2	43.8
8	3	2	3	50.2
9	3	3	1	47.5



Figure S2. Bead-on-string morphology of 7 wt% PCL/MXene fibers at 50 μm target diameter.

Table S5. Summary of calculation parameters for photothermal conversion efficiency.

Parameter	1 wt% PCL/MXene	4 wt% PCL/MXene	Data source
Sample mass (m/g)	0.0066	0.0070	Measured by weighing
Sample area (S/cm^2)	0.25	0.25	Projected area
Laser power density ($I_0/(W/cm^2)$)	0.50	0.50	Instrument default
Laser power (I/W)	0.125	0.125	Power density $\times$ area
Ambient temperature ($T_{amb}/^{\circ}C$)	20.0	20.0	Experimental record
Equilibrium temperature ($T_{max}/^{\circ}C$)	55.0	60.0	Experimental record
Absorbance (A_{808})	1.28	1.30	Measured by UV-vis-NIR
Specific heat capacity ($C_p/(J/g\cdot K)$)	2.20	2.43	Measured by DSC