ACCSCIENCE PUBLISHING

International Journal of Bioprinting

ACCEPTED PAPER · SUPPLEMENTARY FILE

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

Article ID: IJB026300324

Citation: Zou Z, Huang X, Shen Z, *et al.* Multifunctional PCL/MXene ultrafine fiber scaffolds with tunable topology and photothermal response. *Int J Bioprint*. 2026. doi: 10.36922/IJB026300324

AccScience Publishing
ORIGINAL RESEARCH ARTICLE
Volume X Issue X (2026)
doi: 10.36922/IJB026300324

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

Running title: PCL/MXene photothermal fiber scaffold

Supplementary File

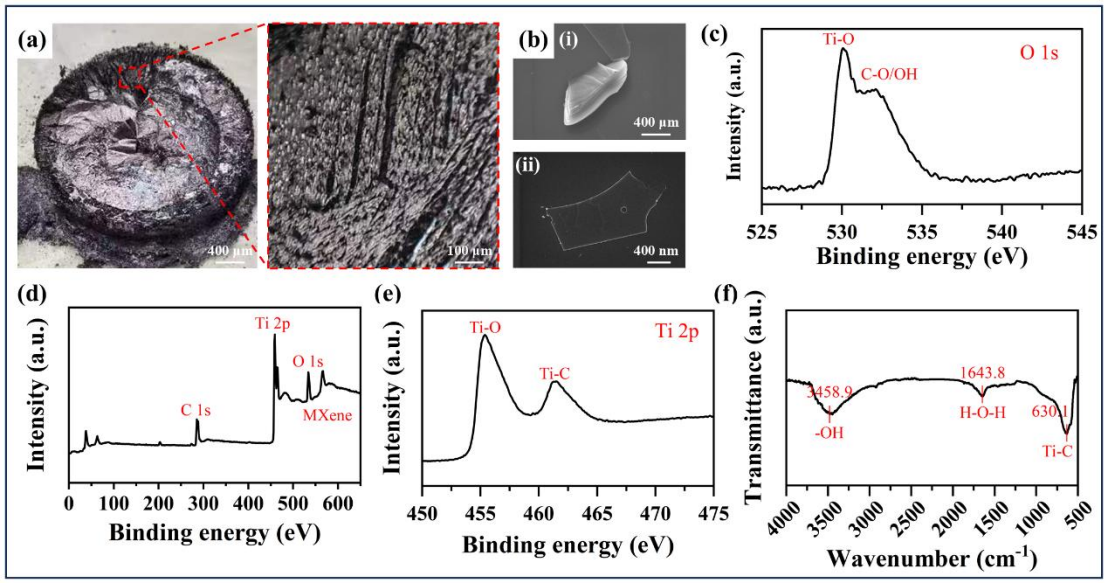

Figure S1. (a) Photograph of the as-prepared MXene and its magnified view; (b) SEM images of $Ti_3C_2T_x$ after HF/HCl etching: (i) multilayered MXene, (ii) monolayer MXene; (c) O 1s spectrum; (d) XPS survey spectrum; (e) Ti 2p spectrum; (f) FTIR spectrum.

Table S1. Influence of printing temperature on fiber forming.

Temperature (℃)	Fiber Diameter (μm)	Jet Stability
90	/	Discontinuity
100	43.8±2.5	Stable
110	50.2±2.1	Stable
120	58.6±3.4	Stable
130	63.5±12.8	Unstable

Table S2. Influence of pneumatic pressure on fiber forming.

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

Table S3. Influence of printing speed on fiber forming.

Printing Speed (mm/min)	Fiber Diameter (μm)	Jet Stability
800	68.5±4.2	Discontinuity
1000	58.2±3.5	Stable
1200	50.4±2.4	Stable
1400	43.6±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℃)	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℃)	1	2	51.8
5	2	2	3	46.3
6	2	3	1	56.5
7	3(120℃)	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/cm²)*	0.25	0.25	Projected area
Laser power density *(I_0/(W/cm²))*	0.50	0.50	Instrument default
Laser power *(I/W)*	0.125	0.125	Power density × area
Ambient temperature *(T_{amb}/℃)*	20.0	20.0	Experimental record
Equilibrium temperature *(T_{max}/℃)*	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·K))*	2.20	2.43	Measured by DSC