Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

MXene/CdS photothermal-photocatalytic hydrogel for efficient solar water evaporation and synergistic degradation of VOC

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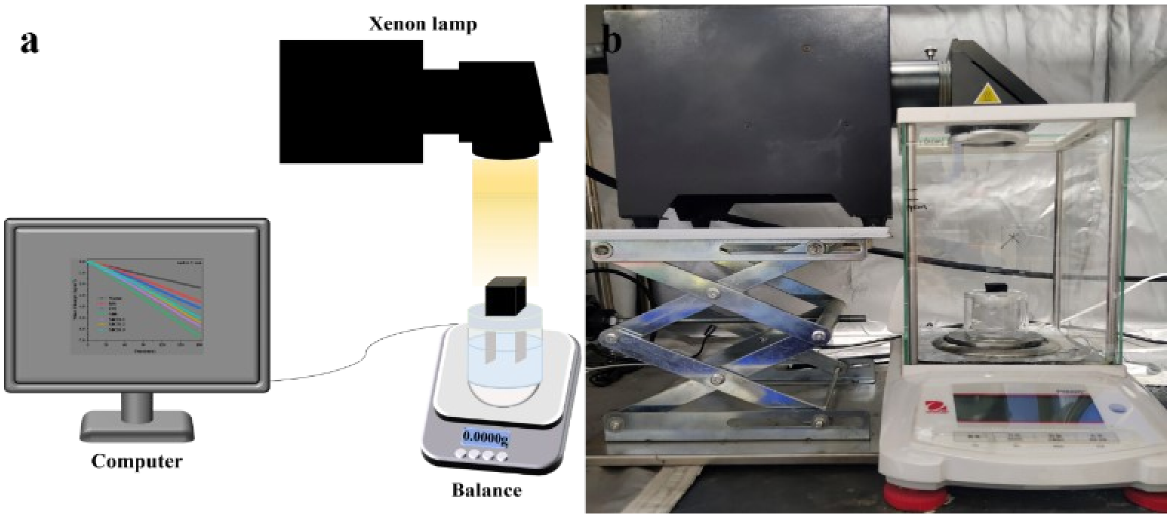

Fig. S1. (a) Schematic and (b) a digital photo of solar-driven interfacial water evaporation device.

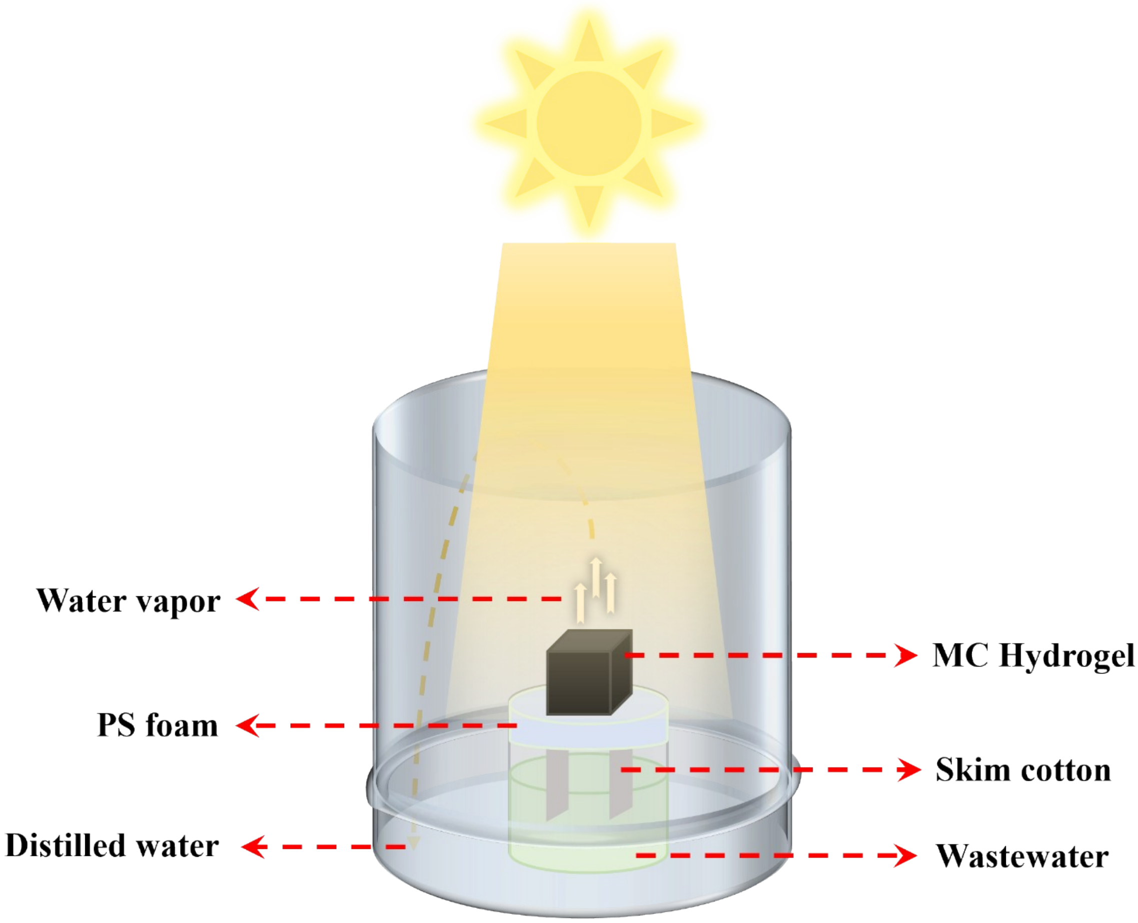

Fig. S2. Schematic of laboratory-made distilled water collection device and internal evaporator.

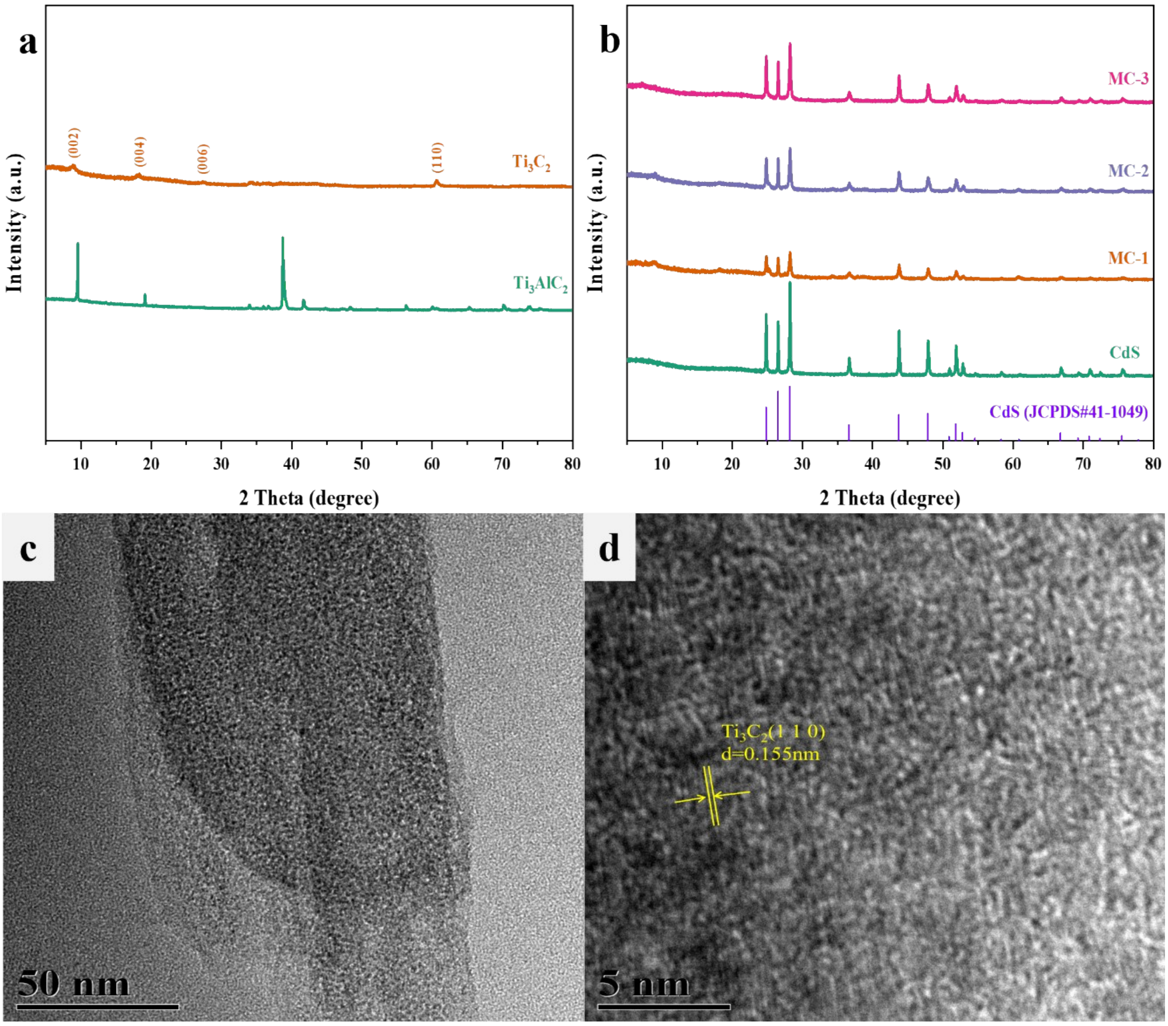

Fig. S3. XRD spectra of (a) Ti_3C_2 and Ti_3AlC_2, (b) CdS and MC composites. (c-d) TEM and HRTEM images of Ti_3C_2 MXene.

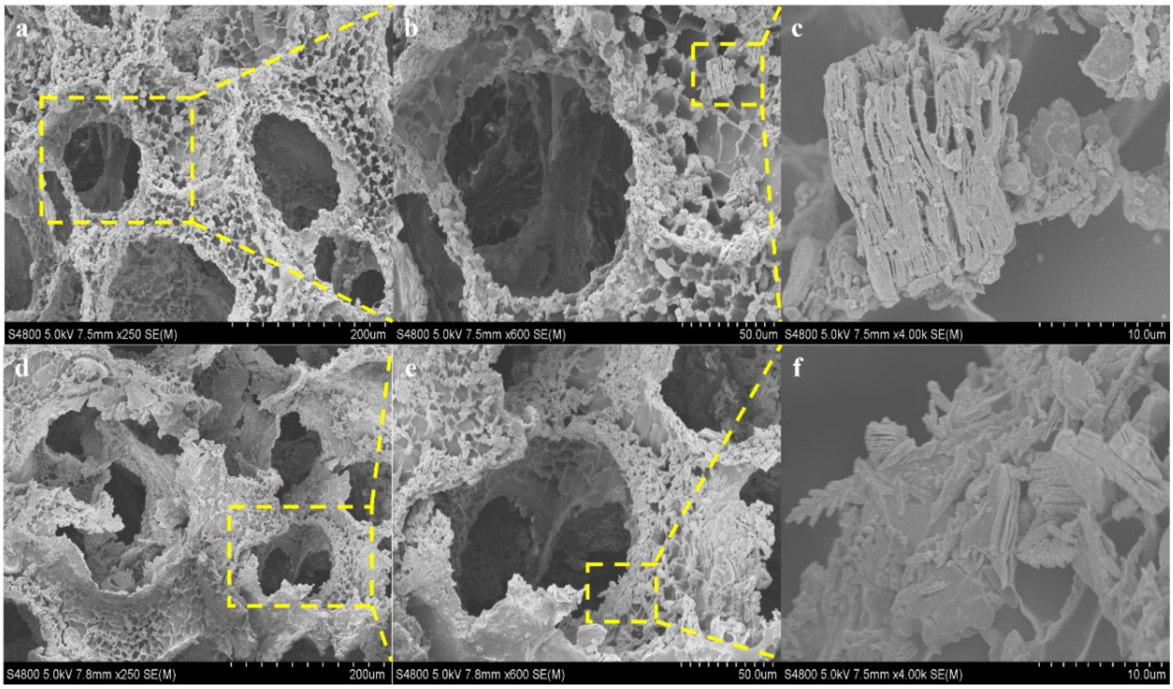

Fig. S4. SEM images of (a-c) MCH-1 and (d-f) MCH-3.

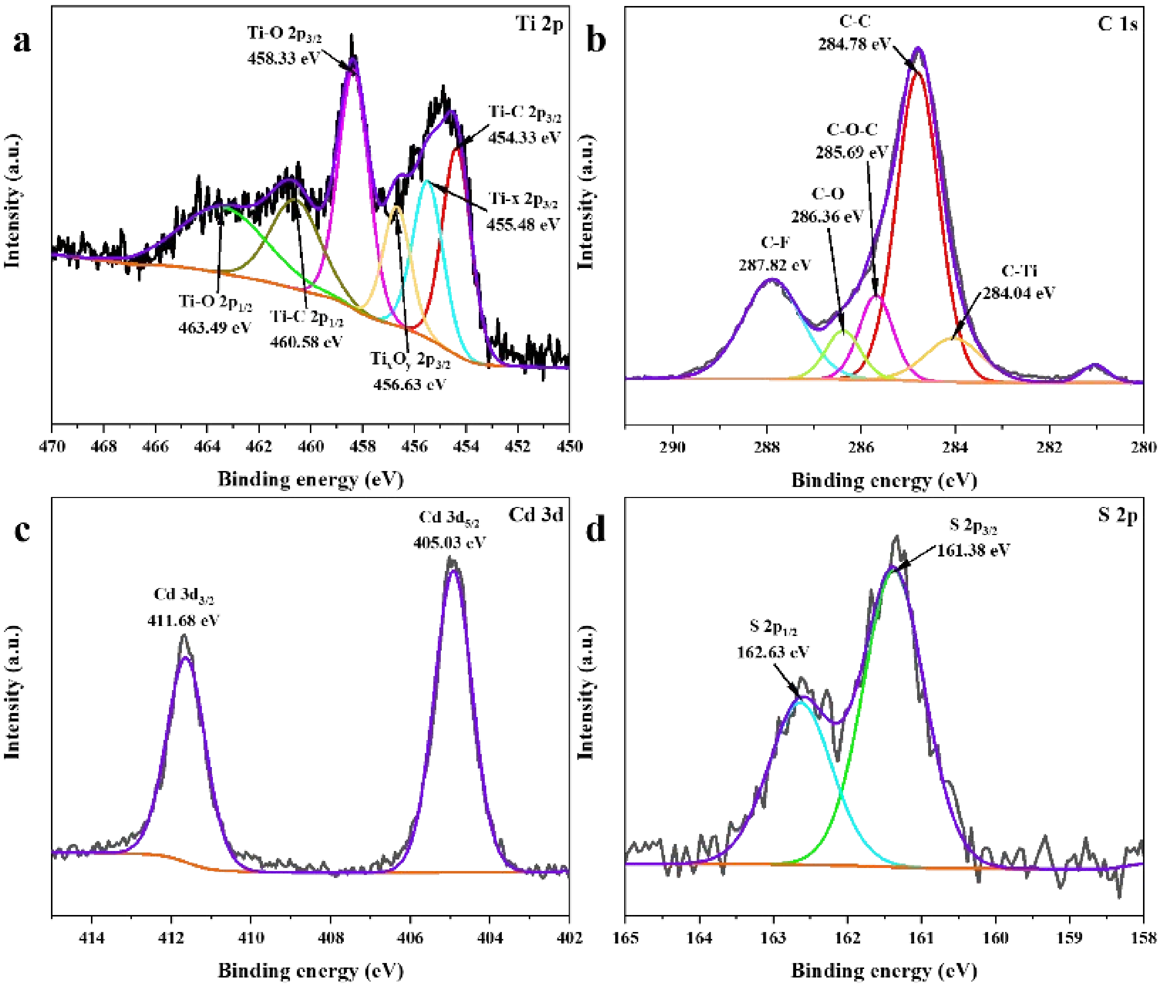

Fig. S5. XPS spectra of MC composites: (a) Ti 2p, (b) C 1s, (c) Cd 3d, and (d) S 2p.

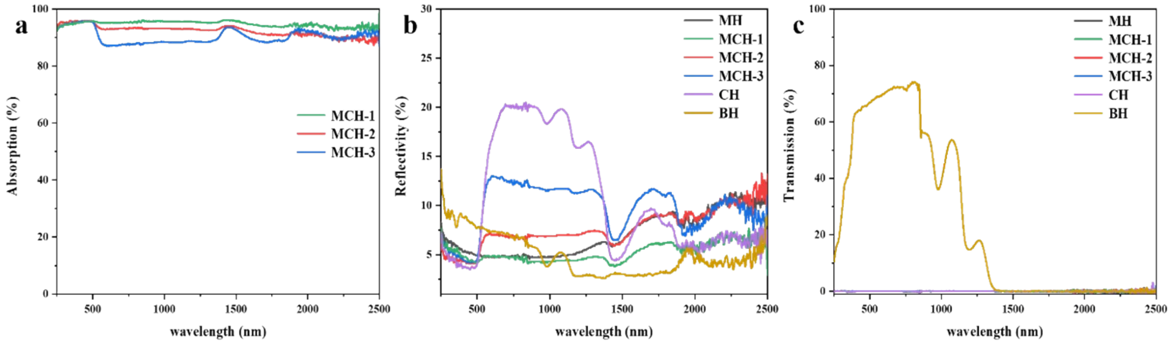

Fig. S6. UV/ViS-NIR (a) absorption, (b) reflection, and (c) projection spectra of MCHs.

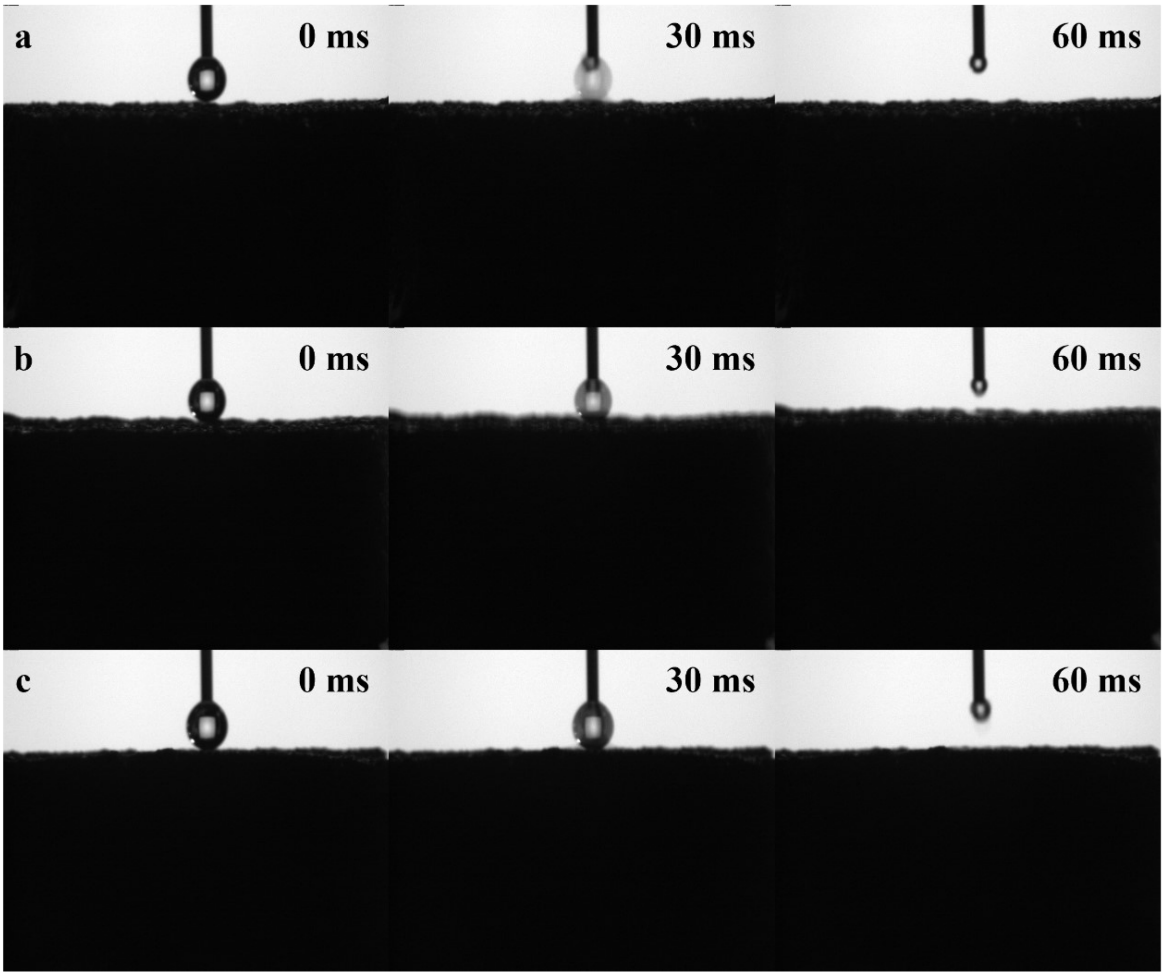

Fig. S7. Surface wettability of (a) MH, (b) MCH-1, and (c) MCH-3 at different contact times.

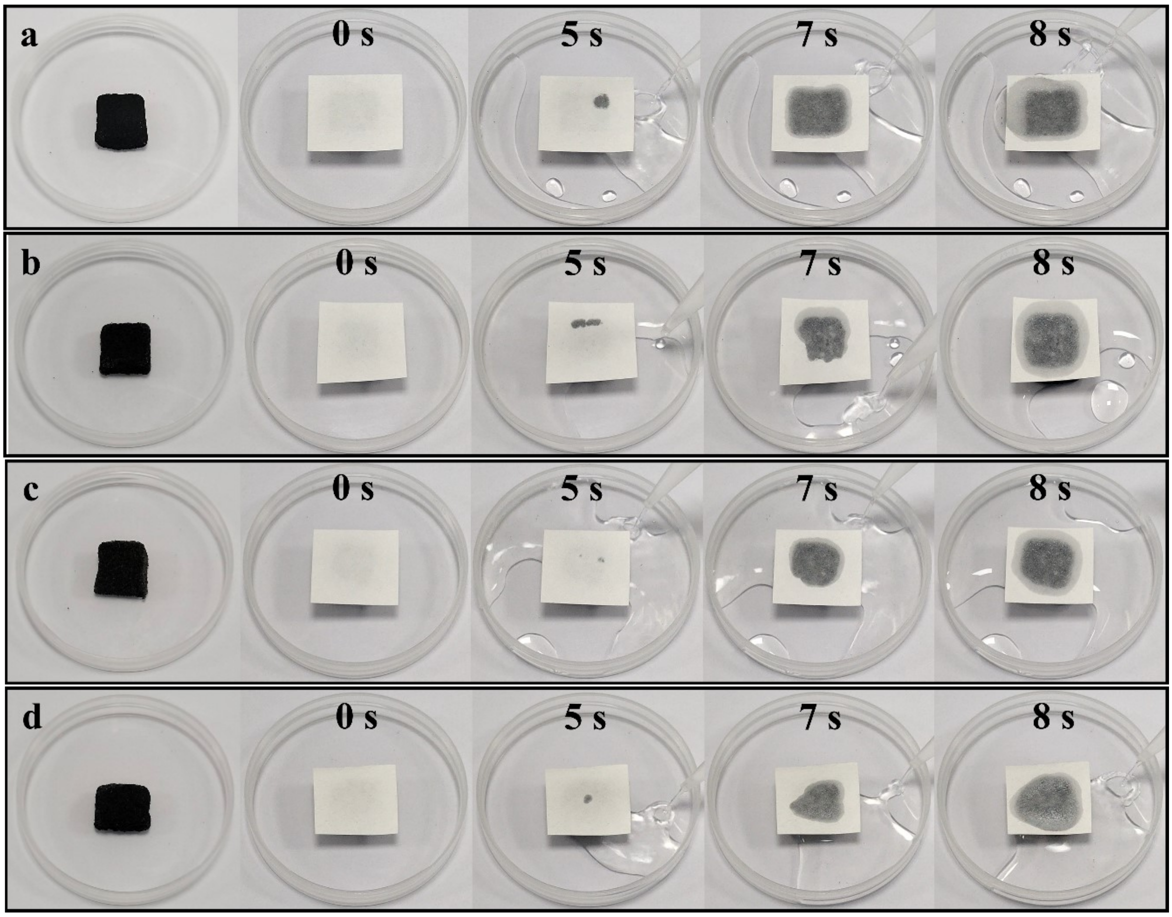

Fig. S8. Water pumping with (a) MH, (b) MCH-1, (c) MCH-2, and (d) MCH-3 and distribution on white cellulose paper at different times.

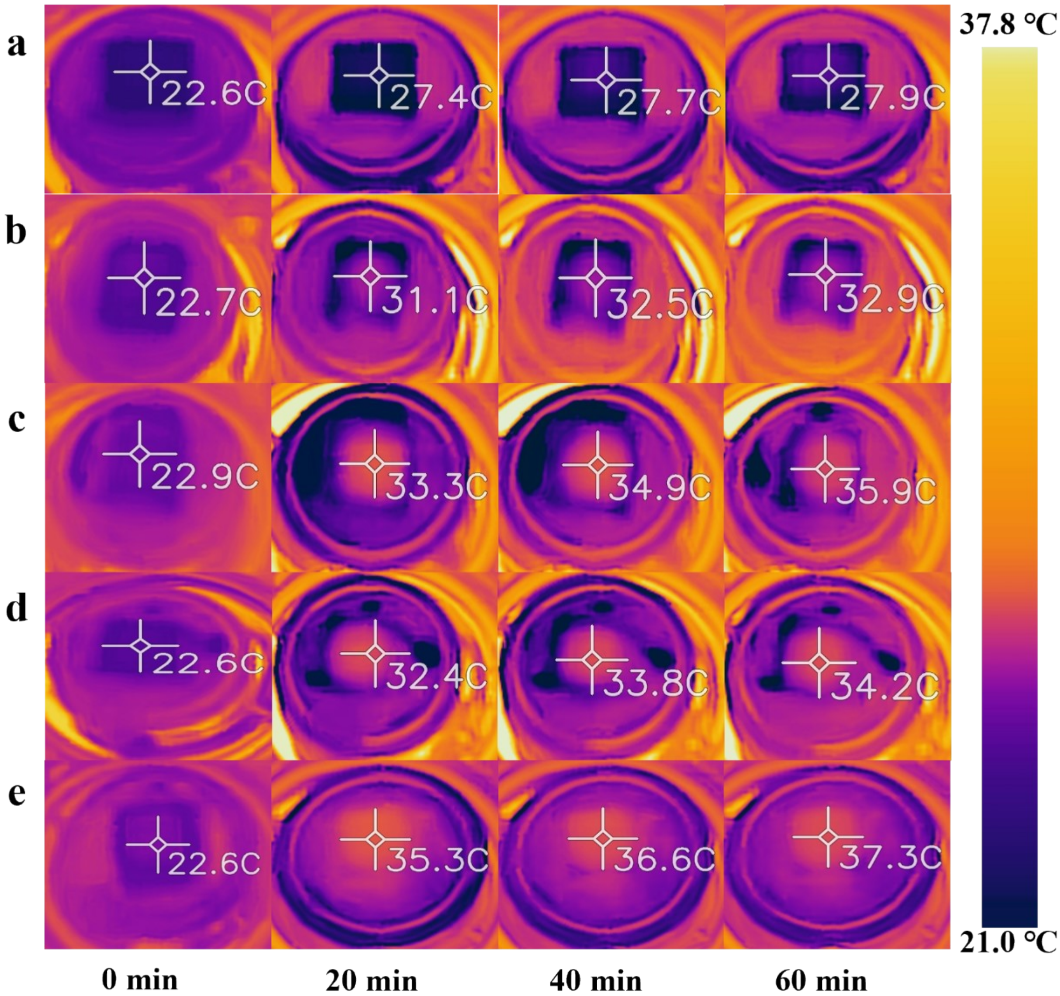

Fig. S9. Infrared images of (a) BH, (b) CH, (c) MCH-1, (d) MCH-3, and (e) MH at different time points under 1.0 sun.

S1. Calculation of the equivalent evaporation enthalpy of water in hydrogels.

The evaporation enthalpy is determined by using the dark state equivalence method. The mass changes of hydrogels and pure water were measured after evaporation in a closed dark environment at 25°C, 35% humidity, and normal pressure for 3h. The calculation formula is as follows:

$$\Delta H_{vap}\, m_0 = \Delta H_{equ}\, m_g$$

Where ΔH_{vap} is the evaporation enthalpy of pure water (2441.7 J g^{-1}), ΔH_{equ} is the equivalent evaporation enthalpy of water in hydrogels, m_0 and m_g are the mass changes of pure water and water in hydrogel, respectively.

Table S1. Comparison of water evaporation performance with MXene-based solar photothermal evaporation materials in recent literature reports.

Samples	**Morphological structure**	**Power density ($kW\ m^{-2}$)**	**Evaporation rate ($kg\ m^{-2}\ h^{-1}$)**	**Ref.**
MXene/PEI/PDA	Modify melamine foam	1	1.50	[1]
PI/MXene	Hybrid aerogel	1	1.24	[2]
MXene/MMT	Hierarchical binary gel	1	1.37	[3]
MXene/Melamine foam	3D microporous architectures	1	1.41	[4]
GO/MXene	3D porous aerogel	1	1.27	[5]
MF-MXene/PPy	Porous melamine foam	1	1.52	[6]
JPP@MXene	3D porous sponge	1	1.48	[7]
Carbonized MXene/PDA foam	3D network skeleton	1	1.60	[8]
Ferrous ion-crosslinked $Ti_3C_2T_x$ MXene-based aerogel films	2D porous films	1	1.67	[9]
$TiO_2/Ti_3C_2/C_3N_4$/PVA	Porous network hydrogel	1	1.54	[10]
Ti_3C_2 MXene/CdS	**3D porous hydrogel**	**1**	**1.80**	**This work**

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Table S2. The evaporation enthalpy of water in MCHs and pure water is calculated。

Sample	Water	BH	CH	MH	MCH-1	MCH-2	MCH-3
Enthalpy (J g^{-1})	2441.7	2027.3	1891.5	1600	1661.5	1748.8	1636.3

Note: h_{LV} and ΔH_{equ} are numerically equivalent.