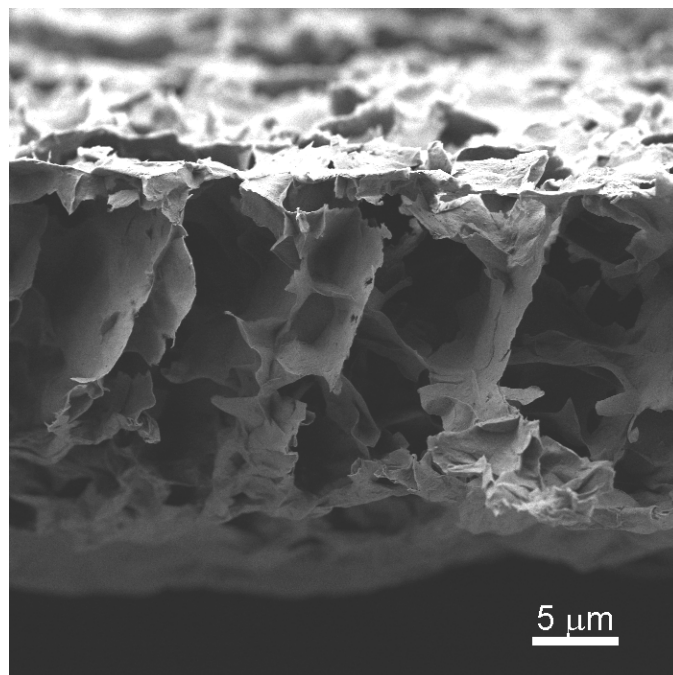


**Durable hydrophobic photothermal membrane based on honeycomb  
structure MXene for stable and efficient Solar Desalination.**

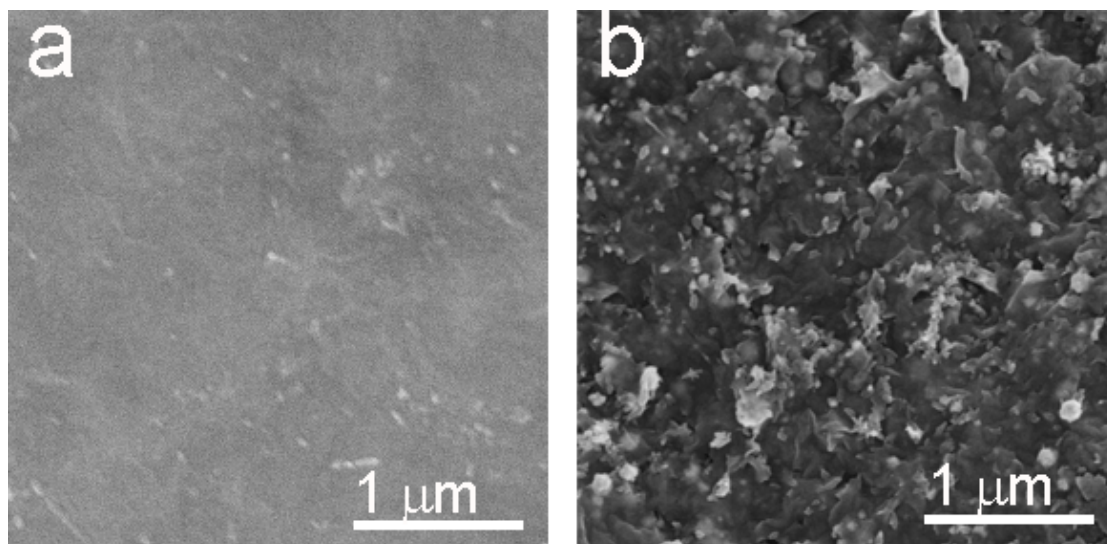
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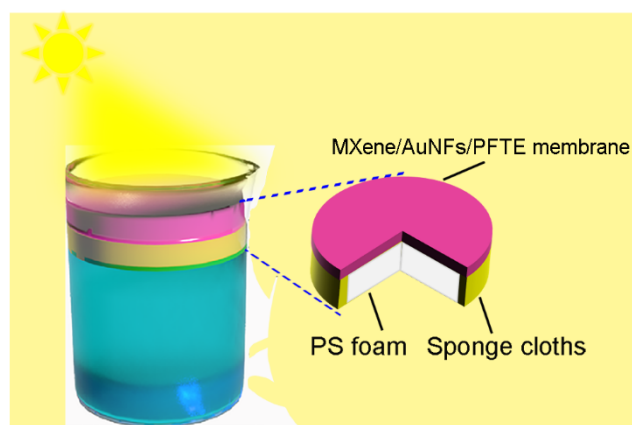
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**Fig. S1.** Cross-sectional SEM images of hydrophobic MXene/AuNFs membrane. The thickness is about 18 μm.



**Fig. S2.** Scanning electron microscopy (SEM) images of pristine MXene (a) and hydrophobic MXene/AuNFs (b).



**Fig. S3.** The schematic drawing of solar driven water evaporator.



**Fig. S4.** Digital image showing visible steam generation enabled by the hydrophobic MXene/AuNFs membrane under  $4 \text{ kW m}^{-2}$  illumination.



**Fig. S5.** Digital image of the water desalination device for freshwater production.

**Table S1.** A comparison of the solar steam generation performance of our results with some typical published data.

Photothermal Materials	water evaporation rates (Kg m <sup>-2</sup> h <sup>-1</sup> )	Efficiencies (% , 1 sun)	Efficiencies (% , 2 sun)	Efficiencies (% , x sun)	Ref. No.
hydrophobic MXene/AuNFs	1.59	97.8	□	□	This work
HPCM/PHS	1.38	90.8	□	□	[1]
HN/CNT	1.09	83.2	□	92.8 (10 sun)	[2]
In-air calcinated MS	1.98	92	□	□	[3]
Cu <sub>2</sub> SnSe <sub>3</sub>	1.657	86.6	□	□	[4]
carbon black/hollow glass microspheres	1.38	82.1	□	□	[5]
AuNR/SWNT film	1.85	82	□	94 (5 sun)	[6]
p-PEGDA-PANi	1.4	91.5	□	□	[7]
CuS/MCE	1.12	~80±2.5	□	□	[8]
MXene-PVDF	-	84	□	□	[9]
WO <sub>2,9</sub> nanorods	1.28	81	□	□	[10]
activated carbon fiber	1.22	79.4	□	□	[11]
hydrophobic MXene	1.31	71	□	□	[12]
N-doped graphene aerogel	1.558	90	□	□	[13]
wasted rice straw	1.2	75.8	□	□	[14]
PPy-coated PVDF	1.70	93.8	□	□	[15]
polymer aerogel	0.987	81	85	88 (3 sun)	[16]
black titania nanocages	1.13	70.9	□	□	[17]
PAAm-radial aerogel	2.0	85.7	□	□	[18]
PEG MoS <sub>2</sub> -cotton cloth	1.287	80.5	86.8	90.3 (5 sun)	[19]
GDY-based foam	1.55	91	□	□	[20]

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