

## Supplementary Material

# Biochar-Based Photothermal Hydrogel for Efficient Solar Water Purification

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**Table S1.** The solar thermal conversion efficiency of H<sub>2</sub>O and ACPH membranes.

Parameters	H <sub>2</sub> O	ACPH-0	ACPH-2	ACPH-5	ACPH-10	ACPH-20
m <sub>r</sub>	1	1.82	1.39	1.37	1.31	1.32
h <sub>0</sub> (kJ kg <sup>-1</sup> )	2419	2418	2402	2398	2395	2397
h <sub>lv</sub> (kJ kg <sup>-1</sup> )	2419	1328	1728	1750	1828	1816
Evaporation rate (kg m <sup>-2</sup> h <sup>-1</sup> )	0.37	0.85	1.16	1.56	1.66	1.51
Increased Temperature (K)	10.1	10.5	17.6	16.3	19.4	18.9
Efficiency (%)	25.3	32.4	58.1	78.8	88.0	79.5

**Table S2.** The ICP results of polluted water containing heavy metal ions before (c=10 ppm) and after solar purification with ACPH membrane.

Ions	Stock Solution (mg L <sup>-1</sup> )	Steamed Water (μg L <sup>-1</sup> )	Rejection Efficiency (%)
Cr <sup>2+</sup>	10	2.21	99.98
Cd <sup>2+</sup>	10	1.66	99.99
Pb <sup>2+</sup>	10	2.03	99.98

**Table S3.** The ICP results of polluted water containing heavy metal ions before (c=100 ppm) and after solar purification with ACPH membrane.

Ions	Stock Solution (mg L <sup>-1</sup> )	Steamed Water (μg L <sup>-1</sup> )	Rejection Efficiency (%)
Cr <sup>2+</sup>	100	4.32	99.99
Cd <sup>2+</sup>	100	2.56	99.99
Pb <sup>2+</sup>	100	8.20	99.99

**Table S4.** The ICP results of simulated seawater before and after solar purification with PPPH-CF membrane.

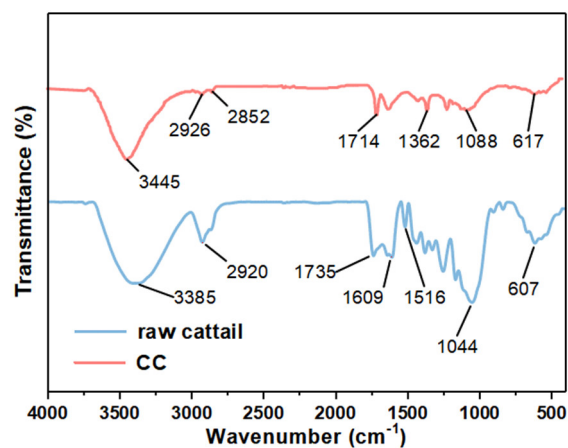
<b>Ions</b>	<b>Stock Solution (mg L<sup>-1</sup>)</b>	<b>Steamed Water (mg L<sup>-1</sup>)</b>	<b>Rejection Efficiency (%)</b>
Na <sup>+</sup>	10780	0.7952	99.99
Mg <sup>2+</sup>	1298	0.0246	99.99
K <sup>+</sup>	400	0.0451	99.99
Ca <sup>2+</sup>	410	0.0436	99.99

**Table S5.** Comparison of ion concentration in steamed water produced by evaporators of different materials

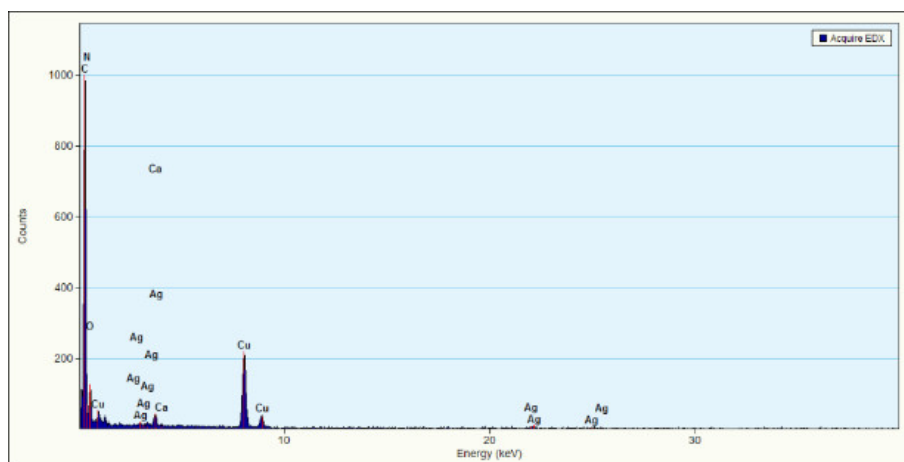
<b>Evaporator</b>	<b>Na<sup>+</sup> (mg L<sup>-1</sup>)</b>	<b>Mg<sup>2+</sup> (mg L<sup>-1</sup>)</b>	<b>K<sup>+</sup> (mg L<sup>-1</sup>)</b>	<b>Ca<sup>2+</sup> (mg L<sup>-1</sup>)</b>	<b>References</b>
Ag/PPy-PMBA-BrILs	~2	~0.5	~0.8	~1	[1]
HPH-based SVG	~6	0.95	~0.9	~0.9	[2]
rGOHM	~1	~0.3	~0.15	~0.4	[3]
SCG	~11	~2.3	~1.5	~8	[4]
CBS-Ti <sub>3</sub> C <sub>2</sub>	~5	~0.2	~0.8	~0.5	[5]
HHEs	~1.2	~0.2	~0.5	~0.4	[6]
SSC5	13.5	1.62	4.47	1.88	[7]
ACPH-10	0.7952	0.0246	0.0451	0.0436	<b>Our work</b>

**Table S6.** The HPLC results of water samples containing dyes before and after solar purification with ACPH membrane.

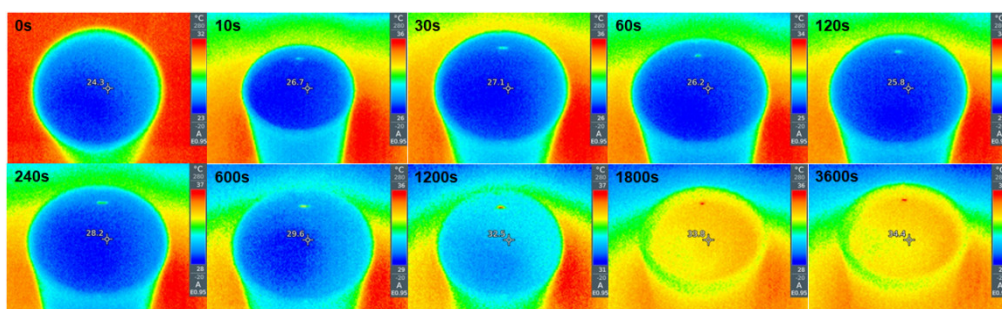
<b>Dyes</b>	<b>Stock Solution (mg L<sup>-1</sup>)</b>	<b>Steamed Water (mg L<sup>-1</sup>)</b>	<b>Rejection Efficiency (%)</b>
Rhodamine B	10	0.015	99.85
Methyl orange	10	0.021	99.79
Methylene blue	10	0.013	99.87



**Figure S1.** FT-IR spectra of raw cattail and CC.



**Figure S2.** The energy dispersive spectrum analysis of the AgNPs@CC.



**Figure S3.** Digital infrared thermal images of pure water.

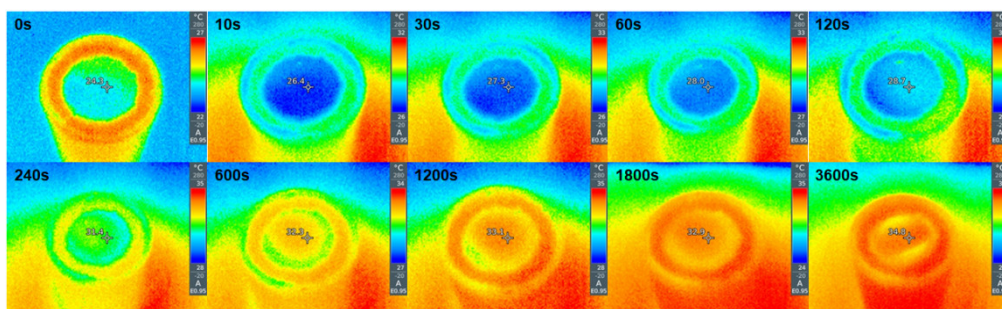


Figure S4. Digital infrared thermal images of pure water with ACPH-0 membrane.

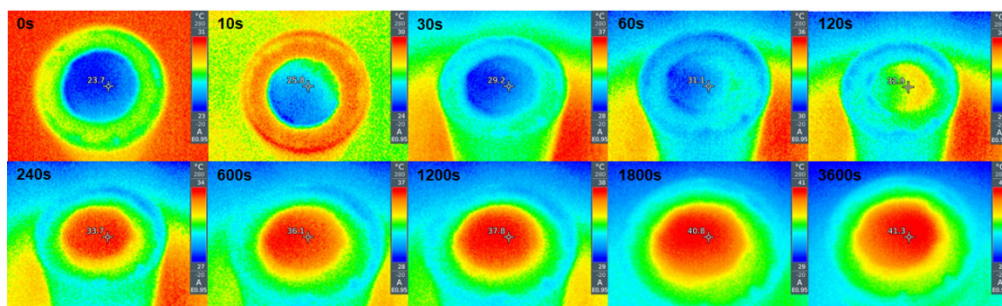


Figure S5. Digital infrared thermal images of pure water with ACPH-2 membrane.

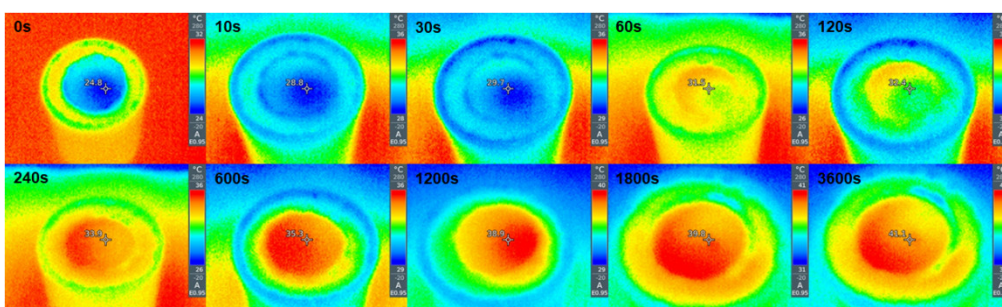


Figure S6. Digital infrared thermal images of pure water with ACPH-5 membrane.

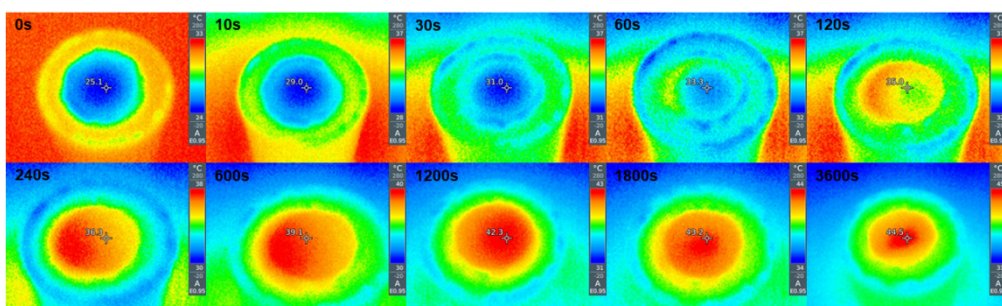
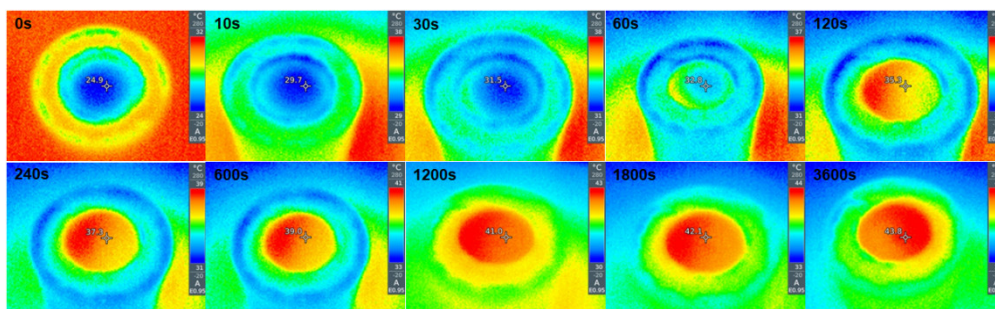


Figure S7. Digital infrared thermal images of pure water with ACPH-10 membrane.



**Figure S8.** Digital infrared thermal images of pure water with ACPH-20 membrane.

## References

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