Supplementary Information

Clean water generation through a multifunctional activated carbon-TiO_2 interfacial solar distillation system

Submitted to

RSC Advances

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Text S1 Analysis of chlorine ions

A 10 mL sample was placed in a sample cell, and 0.8 mL of mercuric thiocyanate solution was added. After mixing, 0.4 mL of a ferric ion solution was added. The sample turned orange if Cl^- was present in the sample. After 2 min, the absorbance of the sample at 455 nm was measured using a DR 6000 UV-Vis spectrophotometer (Hach, USA). For the original saline water, the samples were diluted 1750 times to adhere to the concentration range of the method.

Text S2 Calculation of the evaporation rate, r_{evp}

The evaporation rate, r_{evp}, at a given time **t** was determined by calculating the average of the slopes from time **t – 5** to **t** and **t** to **t + 5** using the following equations:

$$slope_{t-5\to t} = \frac{\Delta W_t - \Delta W_{t-5}}{5} \quad \text{S(1)}$$

$$slope_{t\to t+5} = \frac{\Delta W_{t+5} - \Delta W_t}{5} \quad \text{S(2)}$$

$$r_{evp,t} = \frac{slope_{t-5\to t} + slope_{t\to t+5}}{2} \quad \text{S(3)}$$

where ΔW_t (kg/m^2) represents the total amount of steam generated at time **t** and $slope_{t-5\to t}$ represents the slope between time **t-5** and **t**.

Table S1. Physicochemical properties of (a) activated carbon, (b) P25 TiO_2 and (c) PE foam.

(a)

activated carbon	
form	untreated, granular
autoignition temperature	450 °C
resistivity	1375 μΩ-cm at 20 °C
particle size	20-60 mesh
melting point	3550 °C

(b)

P25 TiO_2	
assay	≥ 99.5%
particle size	21 nm
surface area	35–65 m^2/g
melting point	1850 °C
density	4.26 g/mL at 25 °C

(c)

polyethylene foam	
formula	$(C_2H_4)_n$
melting point	115–135 °C
density	0.88–0.96 g/cm^3
log P	1.02620

Table S2 Measured temperature values using the AC-P25/foam and submerged AC-P25 systems.

	T (℃)			
	AC-P25/foam		submerged AC-P25	
t (min)	water surface	bulk water	water surface	bulk water
0	18.4	20	18.4	20
15	29.6	23.8	33.3	31
30	32.7	27.4	34.3	33.2
40	33.4	27.8	36	35.8

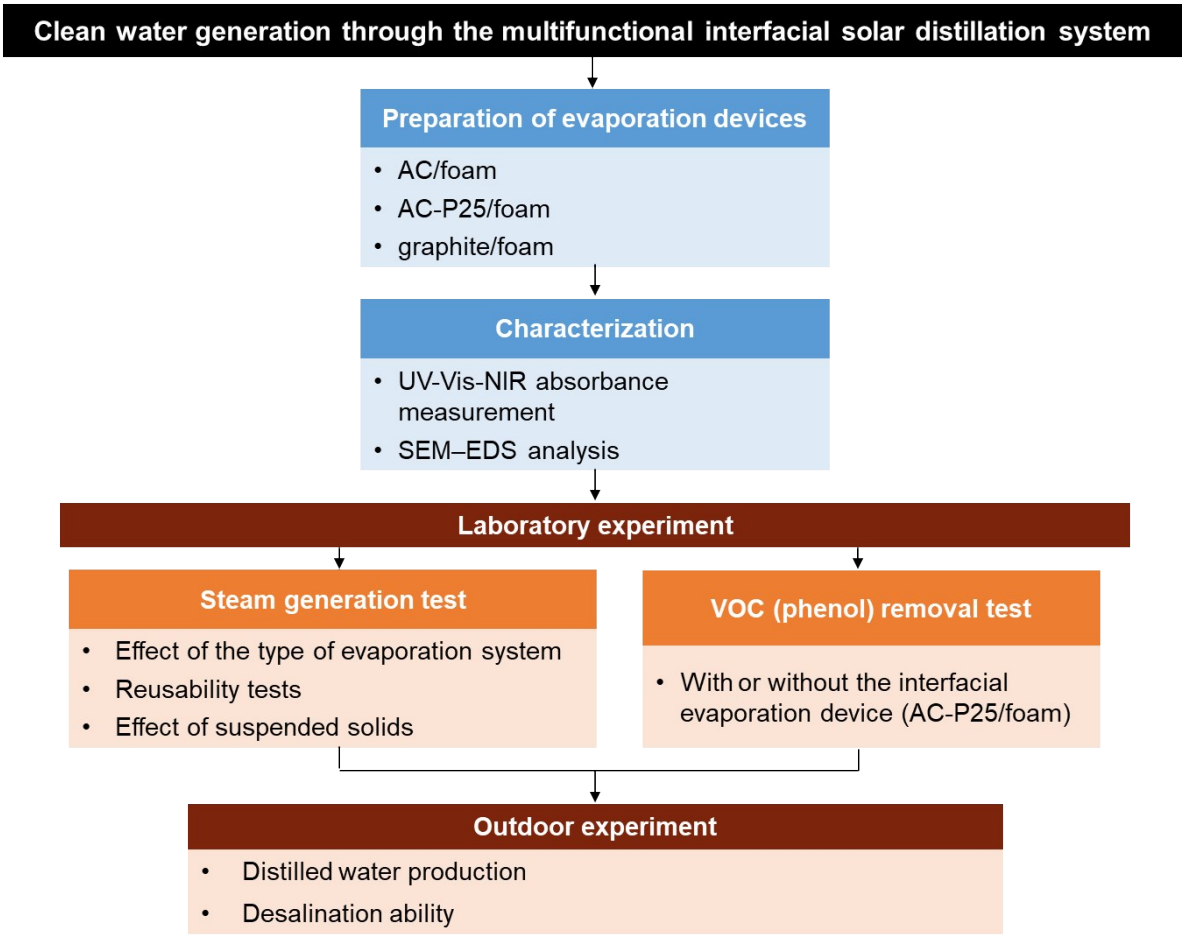

Figure S1. Flowchart of the experimental methodology.

Figure S2. Photo of the solar simulator.

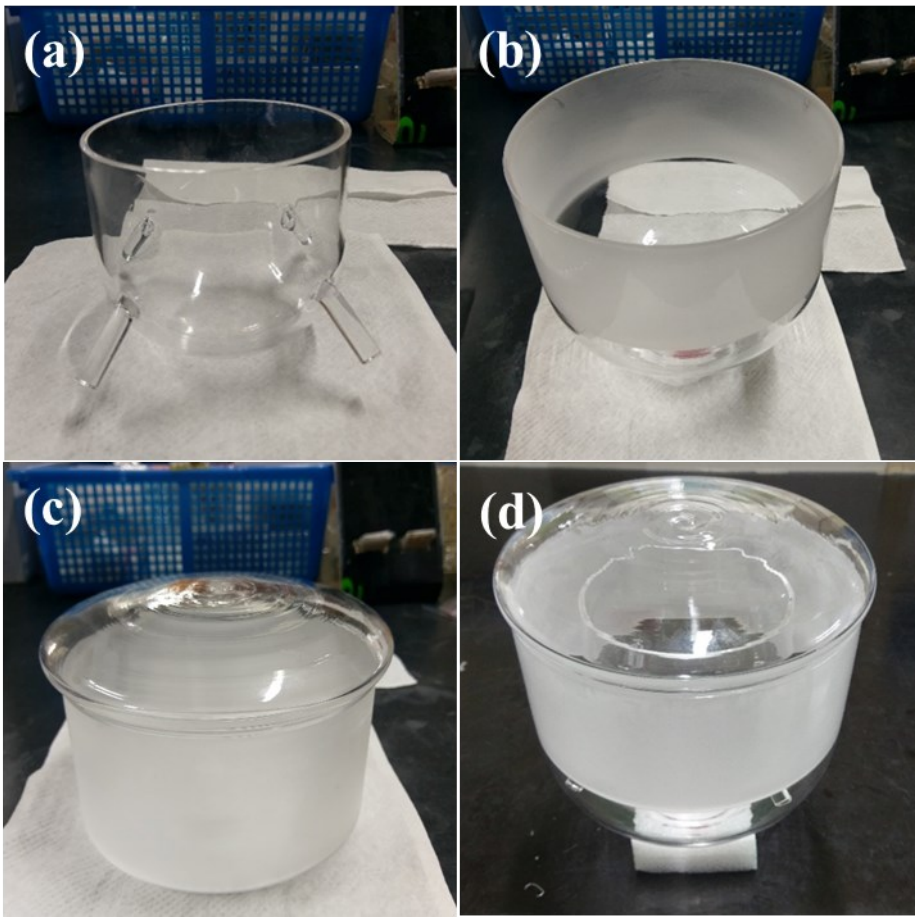

Figure S3. Pictures of the (a) inner bowl, (b) outer bowl, (c) top cover and (d) combined solar still device.

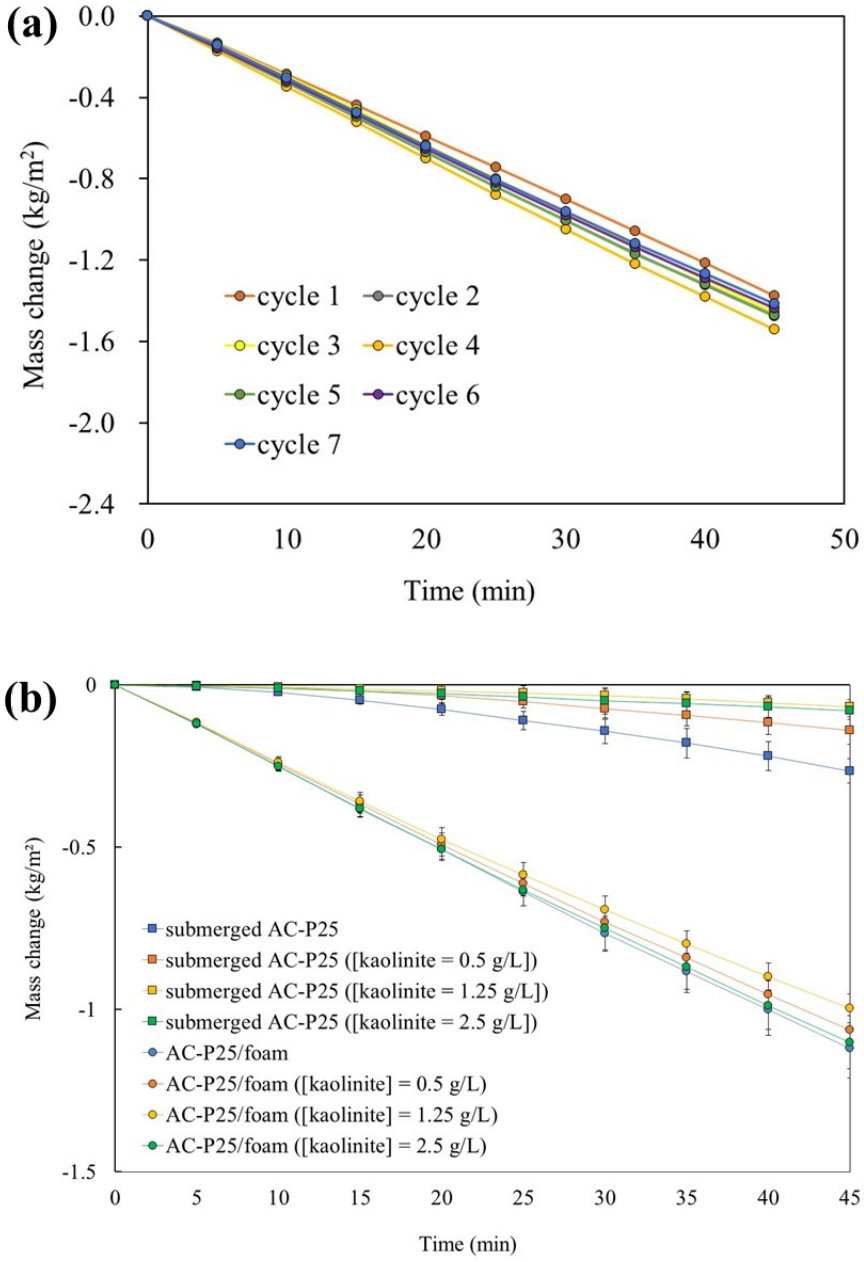

Figure S4. Mass change profile of (a) seven cycle tests (source water: synthetic saline water (3.5 wt% sea salt dissolved in DI water)) and (b) suspended solid tests (source water: DI water in the presence of kaolinite).

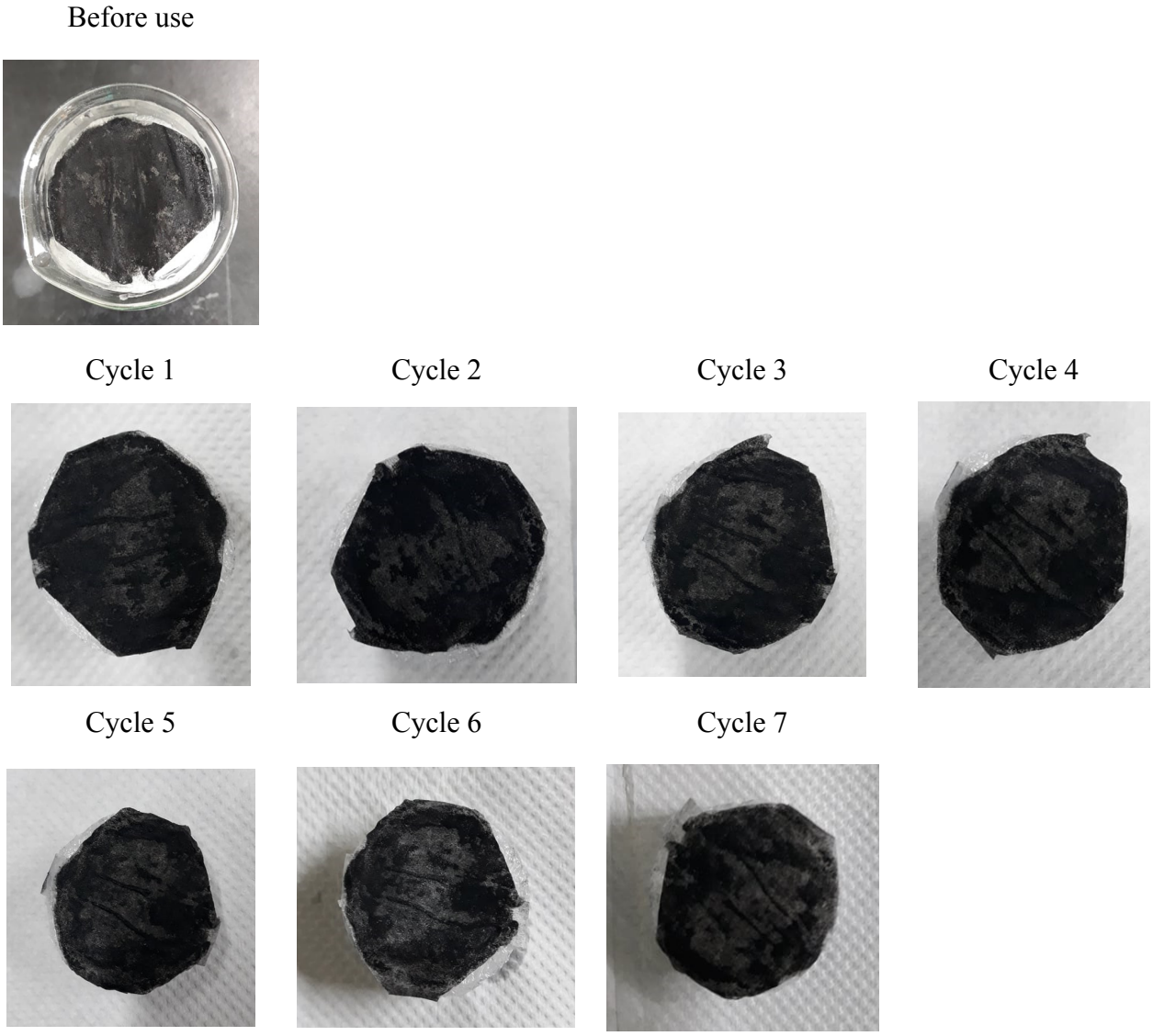

Figure S5. Pictures of AC-P25/foam after different numbers of cycles.

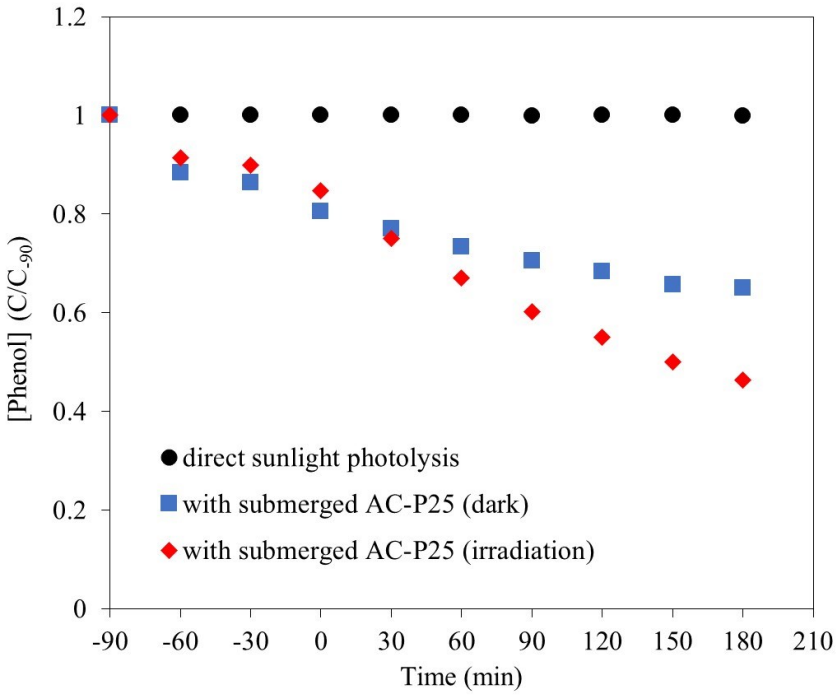

Figure S6. Phenol removal test using submerged AC-P25 (source water: 10 mg L^{-1} phenol solution).

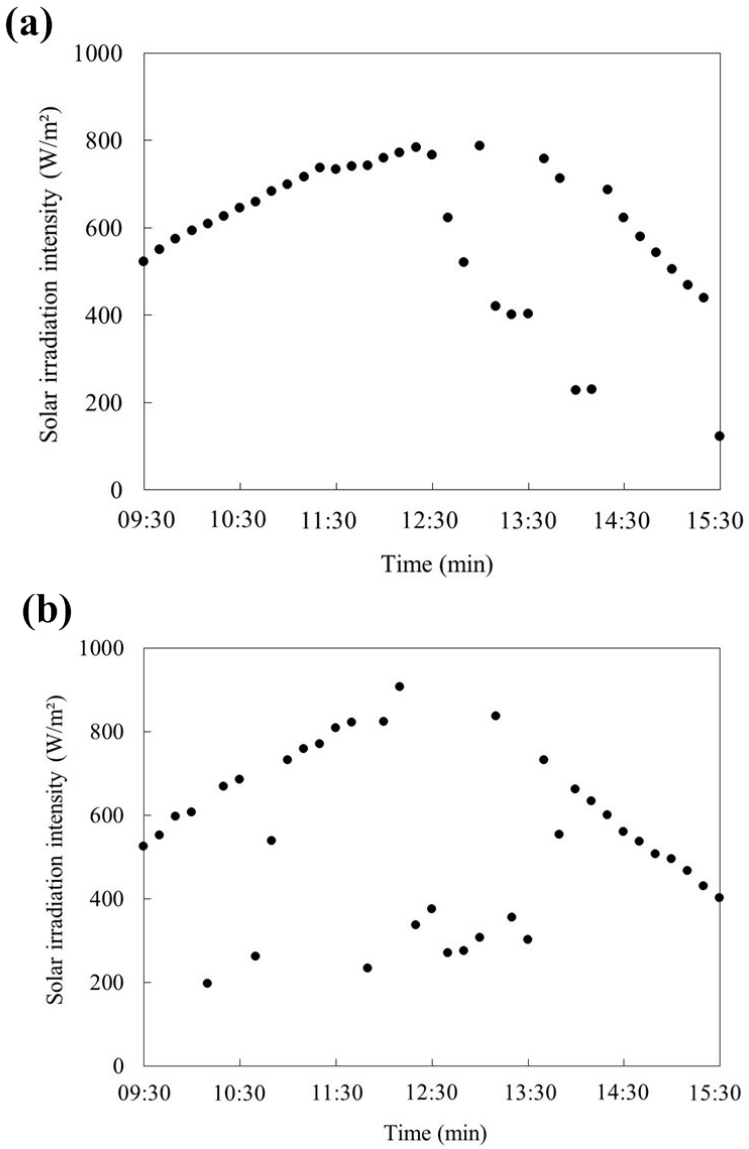

Figure S7. Solar flux density: (a) for the experiment without AC-P25/foam and (b) for the experiment with AC-P25/foam.

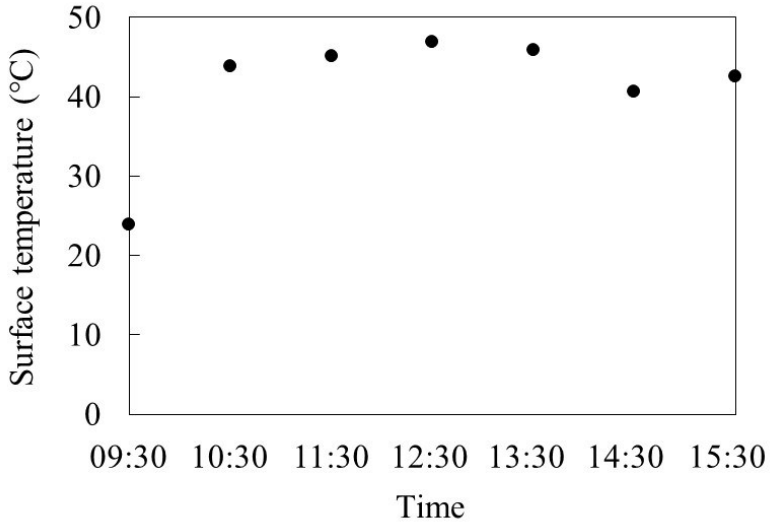

Figure S8. Surface temperature of the interfacial evaporation device.