Supporting Information

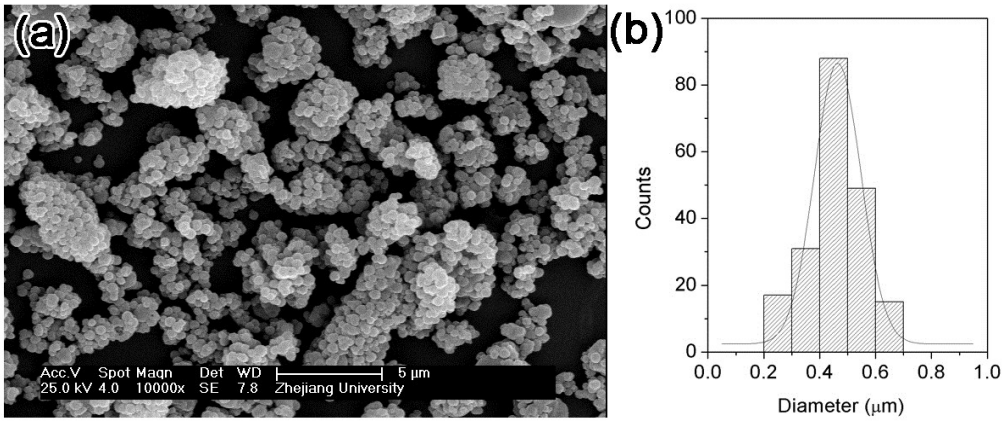

Fig. S1 (a) SEM image of the floating thin film, which contain agglomerates of the Fe_3O_4@C nanoparticles. (b) The size distribution of the Fe_3O_4@C core-shell nanoparticles estimated based on the SEM imaging.

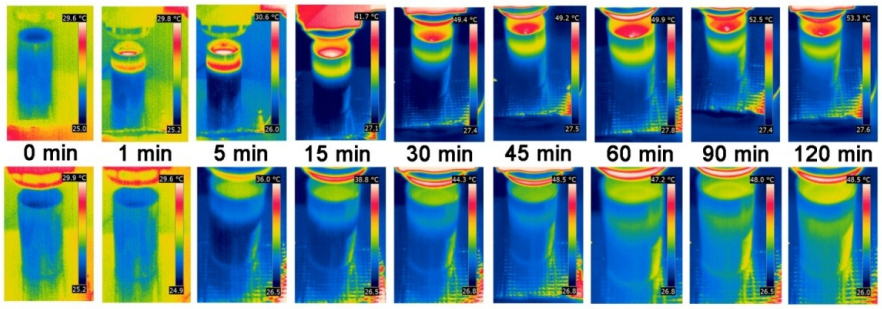

Fig. S2 IR thermal images of (bottom) water only and (top) water with the Fe_3O_4@C floating film on surface with light irradiation with light intensity of 1 $kW \cdot m^{-2}$.

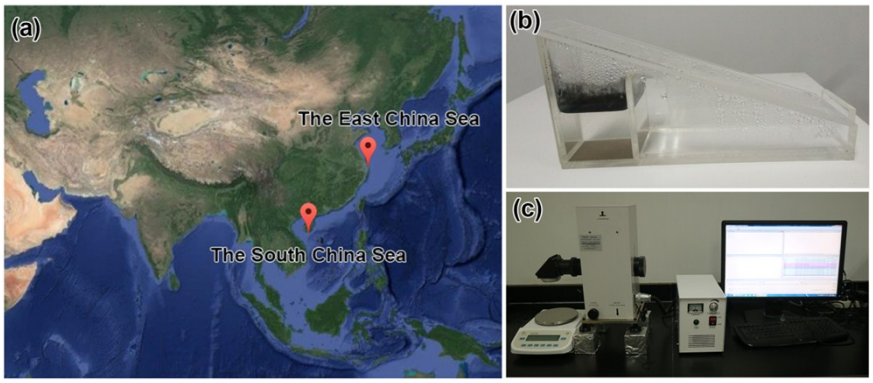

Fig. S3 (a) The locations of the samples; (b) the condensation chamber for collection of freshwater; (c) the water evaporation reaction device.

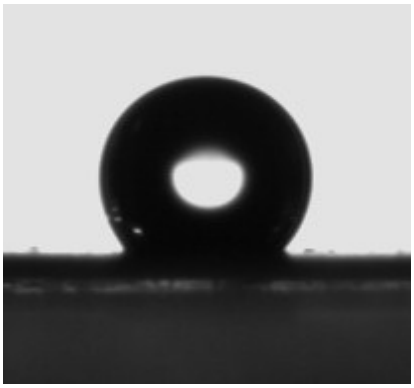

Fig. S4 The water contact angle of the Fe_3O_4@C nanostructures after 8 cycles.

Table S1 The proportion of light absorption in different spectrum regions

Sample	Total absorption	UV (< 400 nm)	Visible (400-760 nm)	Infrared (> 760 nm)
Solar spectrum	100.00%	4.12%	49.54%	46.33%
Fe_3O_4	86.40%	3.61%	41.99%	40.85%
Sample-1	90.22%	3.72%	44.09%	42.42%
Sample-2	90.04%	3.73%	44.19%	42.12%
Sample-3	90.04%	3.73%	44.24%	42.07%
Sample-4	90.32%	3.74%	44.18%	42.41%

Table S2 The zero-order kinetic equations and evaporation efficiencies of different water evaporation processes.

Process	Zero-order kinetic equations	Water evaporation efficiency (k, $kg \cdot m^{-2} \cdot s^{-1}$)	Water evaporation efficiency (k, $kg \cdot m^{-2} \cdot h^{-1}$)	R^2
1	y=0.000130887x+0.00057	1.31×10^{-4}	0.47	0.99835
2	y=0.000227653x-0.07483	2.28×10^{-4}	0.82	0.99679
3	y=0.000244287x-0.09569	2.44×10^{-4}	0.88	0.99801
4	y=0.000233535x-0.02967	2.34×10^{-4}	0.84	0.99908
5	y=0.000295984x-0.06765	2.96×10^{-4}	1.07	0.99902
6	y=0.000210573x-0.08180	2.11×10^{-4}	0.76	0.99653
7	y=0.00026163x-0.081440	2.62×10^{-4}	0.94	0.99867
8	y=0.000281051x-0.14057	2.81×10^{-4}	1.01	0.99657

* Water evaporation by different processes:

(1#) water itself evaporation under simulated solar light

(2#) 0.083 $kg \cdot m^{-2}$ of Fe_3O_4 microspheres float on water surface with formation of a thin film

(3#) 1.03 $g \cdot L^{-1}$ of Sample-2 uniformly dispersed in water

(4#) 0.083 $kg \cdot m^{-2}$ of Sample-2 float on water surface without formation of a thin film

(5#) 0.083 $kg \cdot m^{-2}$ of Sample-2 float on water surface with formation of a thin film

(6#) 0.028 $kg \cdot m^{-2}$ of Sample-2 float on water surface with formation of a thin film

(7#) 0.041 $kg \cdot m^{-2}$ of Sample-2 float on water surface with formation of a thin film

(8#) 0.165 $kg \cdot m^{-2}$ of Sample-2 float on water surface with formation of a thin film

Table S3 The typical water-quality indexes of these two water before and after water evaporation

Samples	Turbidity (NTU)	Conductivity (μS/cm)	TOC (mg/L)	F^- (mg/L)	Cl^- (mg/L)	NO_3^- (mg/L)	SO_4^{2-} (mg/L)	Br^- (mg/L)	Na^+ (mg/L)	K^+ (mg/L)	Ca^{2+} (mg/L)	Mg^{2+} (mg/L)	Fe^{3+} (mg/L)	Cu^{2+} (mg/L)
1	5.38	49800	3.64	1.06	18409	3.76	2593.85	65.28	10217.10	1318.81	861.17	4814.20	0.62	0.96
2	0.10	15.29	1.42	0.060	1.54	<0.10	0.44	<0.10	1.54	0.09	0.24	0.13	0.02	1.05
3	612	35800	3.93	0.02	14149	1.66	1996.57	48.59	7906.80	1181.15	804.57	4393.24	0.61	<0.01
4	0.12	16.76	1.56	<0.10	1.91	<0.10	1.61	0.51	0.61	0.03	0.26	0.03	0.01	<0.01
5	1.0	-	-	1.0	250	10	250	-	200	-	-	-	0.3	1.0
6	5.0	-	-	4.0	250	10	250	-	20	-	-	-	0.3	1.0
7	1.0	-	-	1.5	250	50	500	-	50	-	-	-	0.3	2.0

the South China Sea water (1#) before and (2#) after water evaporation

the East China Sea water (3#) before and (4#) after water evaporation

(5#) the Chinese National Standards for Drinking Water Quality (GB 5749-2006)

(6#) 2012 Edition of the Drinking Water Standards and Health Advisories, Office of Water, U.S. Environmental Protection Agency

(7#) Guidelines for Drinking-water Quality, fourth Edition, World Health Organization 2011