Electronic Supplementary Material (ESI) for Environmental Science: Water Research & Technology.

Supporting information

Architecting a Janus biomass carbon/sponge evaporator with salt-rejection and easy-floatation for sustainable solar-driven steam generation

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Figure S1. Digital photos of steam generated under 3 solar irradiation of JBCS.

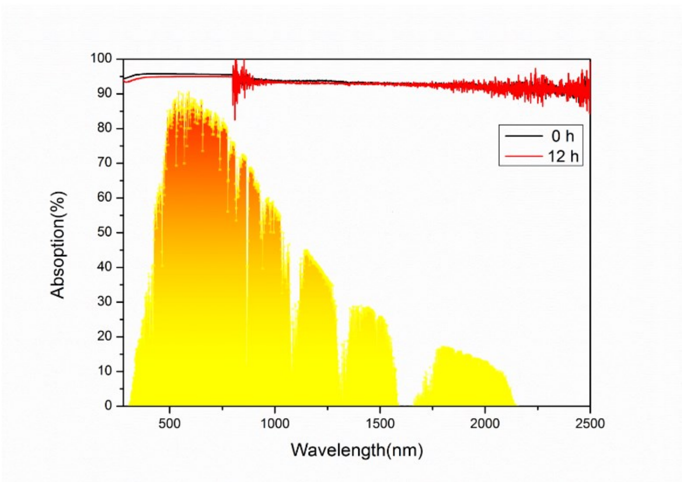

Figure S2. Absorption spectrum of JBCS before and after 12 h steam generation under 1 sun irradiation.

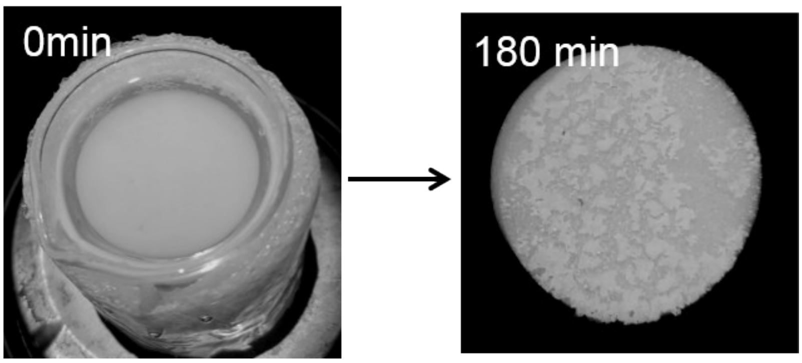

Figure S3. Camera photos of MS before and after 180 min solar steam generation (1 kW m^{-2}).

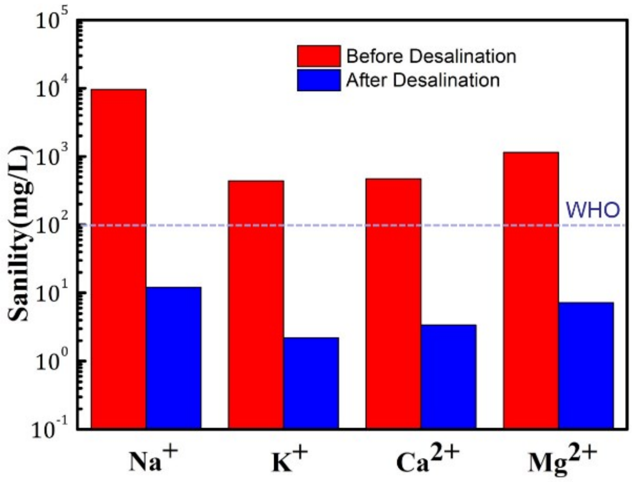

Figure S4. The measured concentrations of four primary ions in a simulated seawater sample before and after desalination.

The energy contribution of each part of the JBCS evaporator in the steam generation process.

(1) Water evaporation loss $\boldsymbol{\theta_1}$

The water evaporation loss of JBCS is approximately equal to the evaporation efficiency, so $\boldsymbol{\theta_1} \sim 86.5\%$.

(2) Sunlight reflection loss $\boldsymbol{\theta_2}$

Measured by UV spectrophotometer, $\boldsymbol{\theta_2} \sim 4\%$.

(3) Conduction loss $\boldsymbol{\theta_3}$

$\theta_3 = (J_{cond} / J_{in}) \cdot A$

Calculated according to Fourier's law, $J_{cond} = k \cdot (\Delta T/L)$, k represents the thermal conductivity of the evaporator, which is 0.046 W m^{-1} K^{-1}. $\Delta T/L$ is the temperature gradient of the JBCS evaporator, about 842 K/m. J_{in} represents a standard sunlight, which is 1 kW m^{-2}. After many statistical calculations, A is about 8. It can be seen that $\boldsymbol{\theta_3}$ is approximately 3.1%.

(4) Radiation loss $\boldsymbol{\theta_4}$

$\theta_4 = A\ \varepsilon\ \sigma\ (T_1^4 - T_2^4)$, ε=0.92 , σ=5.67×10^{-8} W m^{-2} K^{-4} , T_1 is the average surface temperature of the evaporator under one sun exposure, about 310 K, T_2 is the ambient temperature (301 K), in result, $\theta_4 \backsim$ 4.3%.

(5) Convection loss $\boldsymbol{\theta_5}$

$\theta_5 = h\ A\ \Delta T$, h=5 W m^{-2} K^{-1}, ΔT = 310 K. Thus, $\theta_5 \backsim$ 1.3%.

Therefore, 86.5% + 4% + 3.1% + 4.3% + 1.3% =99.2%, other 0.8% of energy may disappear in other forms of diffusion.