# Supporting Information

## Superhydrophilic porous carbon foam as self-desalting monolithic solar steam generation device with high energy efficiency

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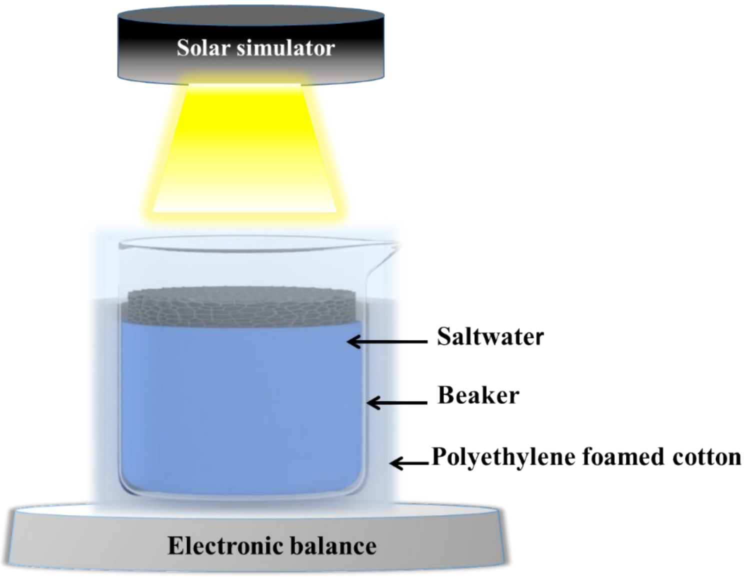


Fig. S1. The diagram of solar evaporation experimental device.

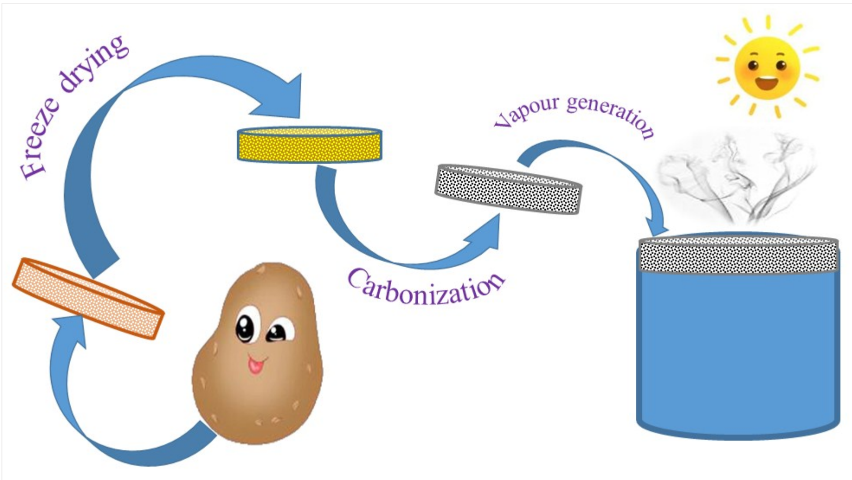


Fig. S2. Preparation of superhydrophilic porous carbon foam.

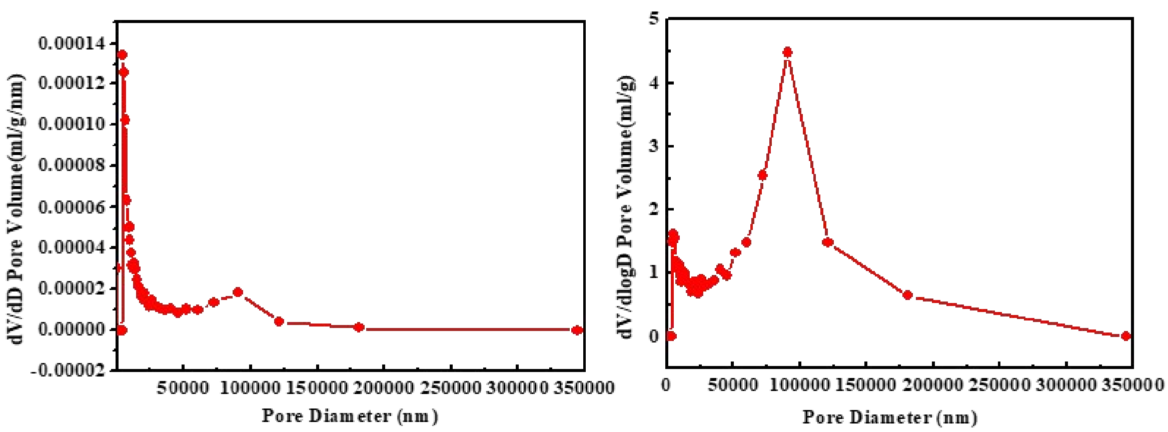


Fig. S3. Pore size distribution curve of the superhydrophilic porous carbon foam (SPCF).

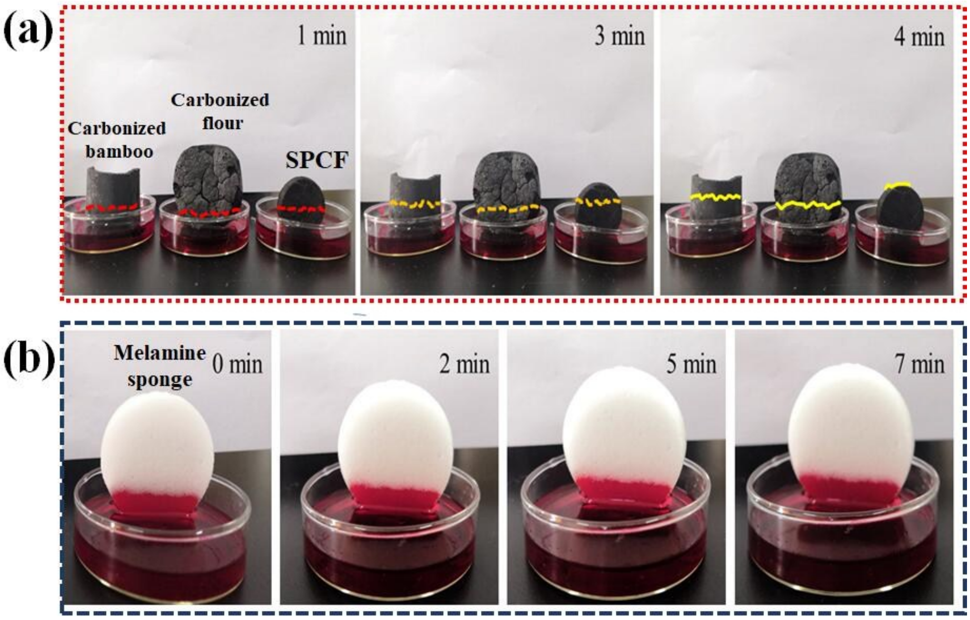


Fig. S4. Water transport performance comparison of different materials. (a) Water transport process of carbonized bamboo, carbonized flour and SPCF; (b) Water transport process of melamine sponge.

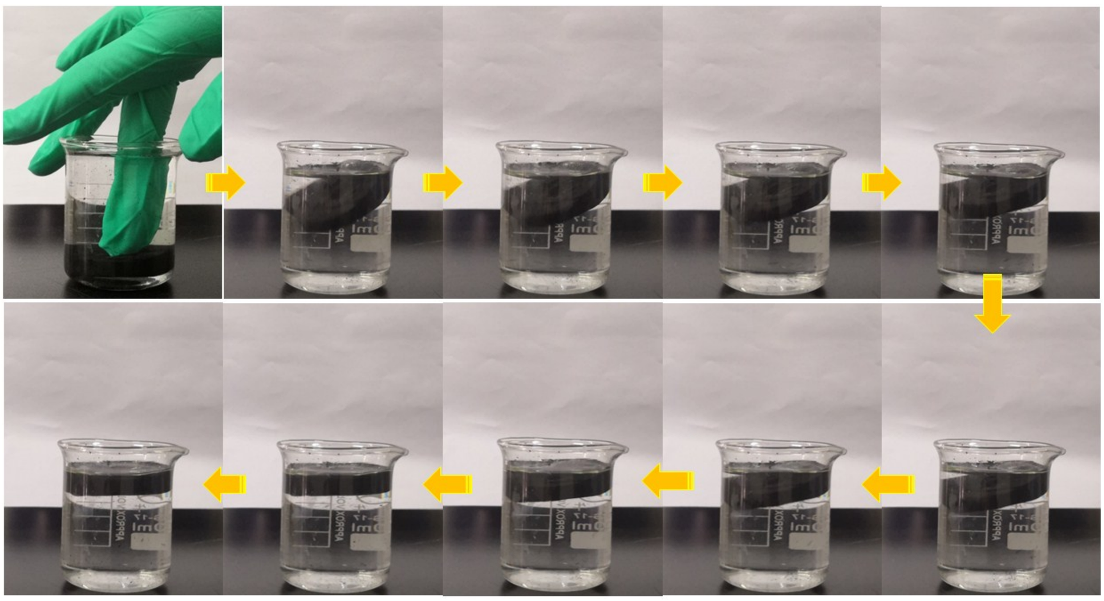

Fig. S5. A set of images of the SPCF float on the water in less than 1 s.


Fig. S6. Camera photographs of SPCF under the weight of 1500 g (~$2.07\times10^4$ Pa).

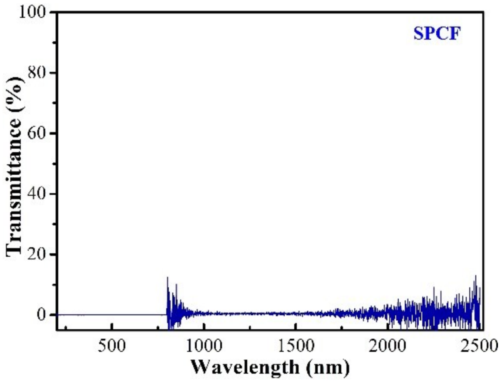


Fig. S7. The transmittance curve of SPCF.

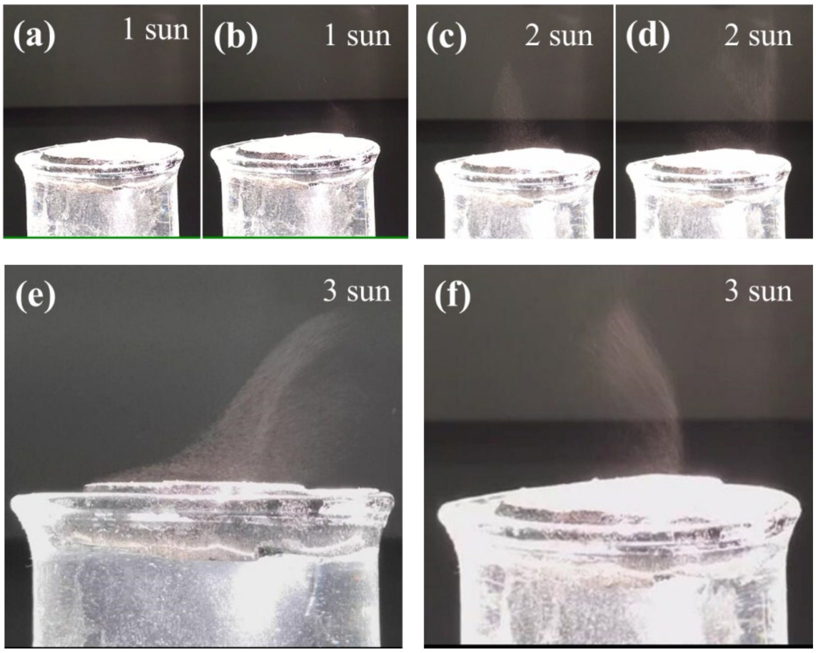


Fig. S8. Camera photos of steam generated under 1~3 solar irradiation of SPCF.

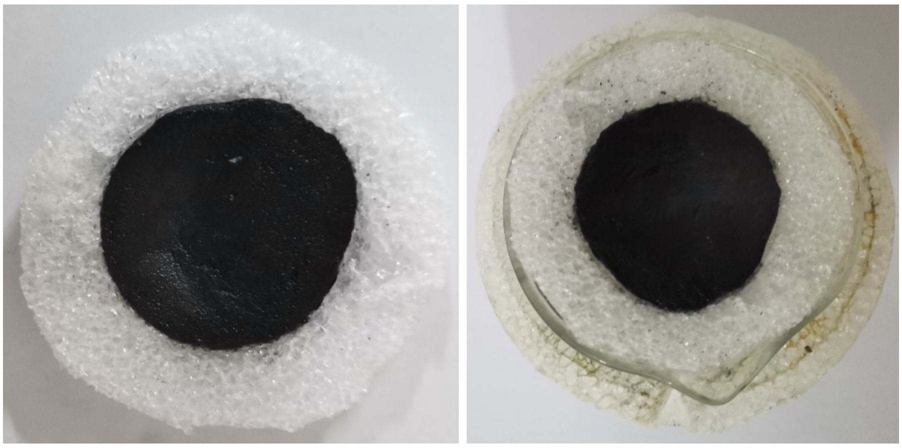

Fig. S9. The physical picture of SPCF wrapped by expanded polystyrene (EPS) foam (left), and the wrapped sample was placed in a beaker (right).

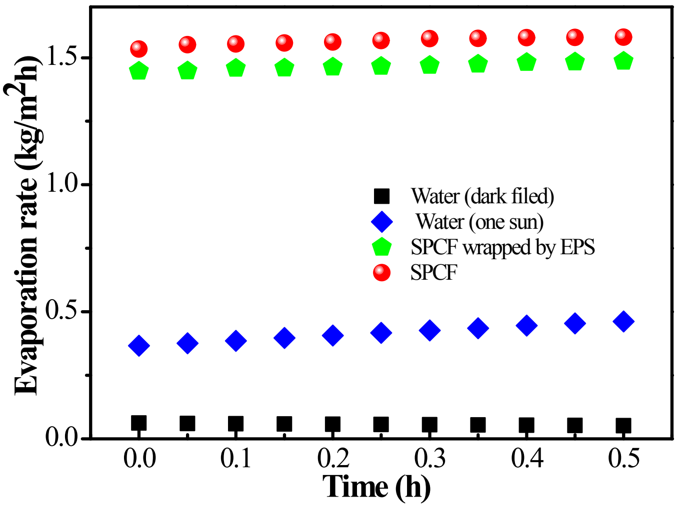


Fig. S10. Evaporation rate of SPCF and SPCF wrapped by EPS under 1 sun illumination. Comparison of evaporation rate of water in dark field and water under 1 sun.

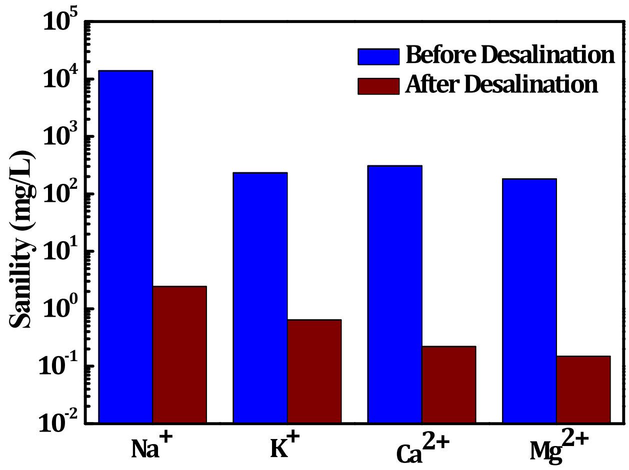


Fig. S11. The measured concentrations of four primary ions in a simulated seawater sample before and after desalination.

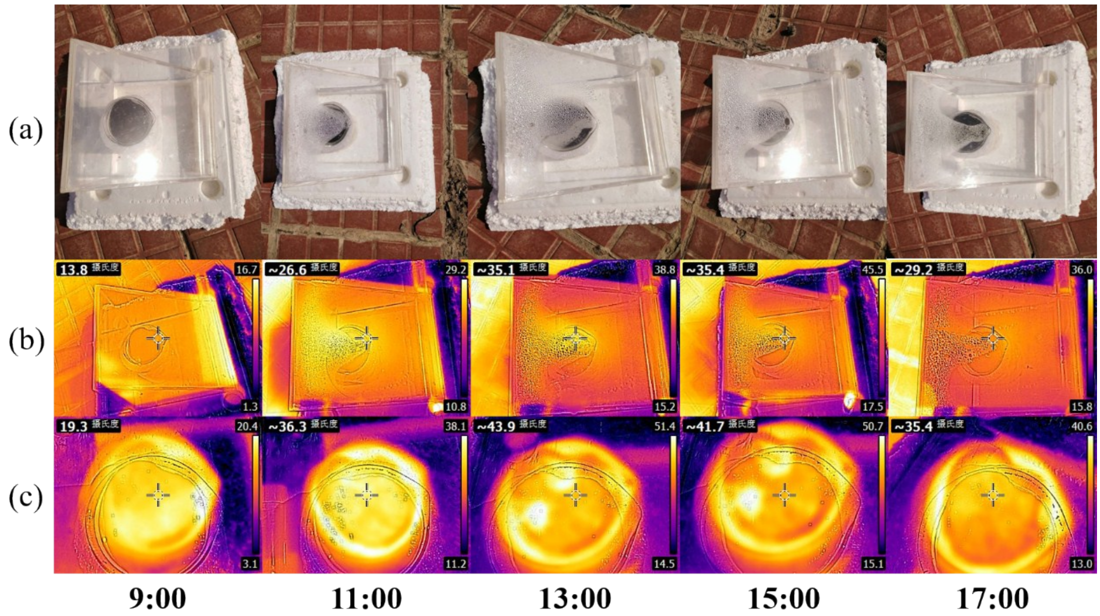


Fig. S12. Outdoor solar water evaporation using SPCF in natural sunlight (on 18th March 2020 at the Shaanxi University of Science and Technology, Xi'an, China). (a) The surface vapor of the collection device was measured at different time, the IR camera photo of the surface temperature of (b) the whole device and (c) the SPCF were prepared at different time. Here, the temperature change of SPCF was measured at the moment just removed the outside device.

Table S1. The wettability, contact angles and wetting time for different solar absorber materials.

| **Materials** | **Wettability** | **Contact angles** | **Wetting time** | **References** |
|---|---|---|---|---|
| Superhydrophilic porous carbon foam | Superhydrophilic | <5° | <15 ms | This paper |
| Carbonized daikon | Hydrophilic | — | 45 ms | [1] |
| MOF-based hierarchical structure (MHS) | Hydrophilic | 7.5° | 406 ms | [2] |
| Plasmonic wood | Hydrophilic | — | 20 s | [3] |
| Sugarcane stems | Hydrophilic | — | 159 ms | [4] |
| Arched bamboo charcoal | Hydrophilic | 25.3° | — | [5] |
| Flexible thin-film black gold membranes | Hydrophilic | 26° | — | [6] |
| CuS/PE membrane | Hydrophilic | — | 50 ms | [7] |
| 2D $Ti_3C_2$ MXene membrane | Hydrophilic | 14.5° | — | [8] |
| MDPC/SS mesh | Hydrophilic | 11.5° | — | [9] |
| CNT/GO, GO/NFC | Hydrophilic | 48°, 23° | — | [10] |
| Multifunctional porous graphene | Hydrophilic | 74° | — | [11] |
| Mushrooms | Hydrophilic | — | 360 s | [12] |
| Flexible thin-film membrane | Hydrophobic | 87±3° | — | [13] |
| Two-dimensional flexible bilayer Janus membrane | Hydrophobic | 110° | — | [14] |
| Durable monolithic polymer foam | Hydrophobic | 130° | — | [15] |
| $Fe_3O_4$@C film | Hydrophobic | 118.01°±1.51° | — | [16] |
| Black polyurethane sponges | Hydrophobic/ Hydrophilic | 120°/60° | — | [17] |

Table S2. The evaporation rate for different materials.

| Materials | Evaporation rate ($kg\ m^{-2}\ h^{-1}$) | References |
|---|---|---|
| Superhydrophilic porous carbon foam (SPCF) | 1.57 | This paper |
| Carbonized mushrooms | 1.475 | [12] |
| Carbonized flour | 1.0 | [18] |
| Carbonized kelp | 1.351 | [19] |
| Hollow-carbon-nanotubes aerogels | 1.3728 | [20] |
| Soot-deposited Janus fabrics | 1.375 | [21] |
| Plasmonic wood | < 1.3 | [3] |
| Sugarcane stems | 1.57 | [4] |
| Carbonized daikon | 1.57 | [1] |
| Arched bamboo charcoal | 1.32 | [5] |
| Carbonized melamine foam | 1.27 | [22] |
| 2D $Ti_3C_2$ MXene membrane | 1.31 | [8] |
| Porous graphene | 1.50 | [23] |
| 3D-print evaporator | 1.25 | [10] |
| $Fe_3O_4$@C film | 1.07 | [16] |
| A durable monolithic polymer foam | 1.1687 | [15] |
| CuS/PE membrane | 1.021 | [7] |
| $MoO_x$ HNS membrane | 1.255 | [24] |
| The bilayer CP/P evaporator | 1.20 | [25] |
| Graphene membranes | 1.37 | [26] |

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