Supporting Information

Denovo Cu-MOF@CNS nanocomposite nested on a cotton fibrils framework for sustainable solar-driven desalination

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1. Calculation of solar-to-vapor efficiency

The sun-to-vapor efficiency was determined using the equation,

$$\eta = \frac{mL_{lv}}{P}$$

where P is the power of solar radiation, L_{lv} is the latent heat of water from the liquid phase to the vapor phase, and m is the mass change flux (i.e., mass change per unit area). By deducting the rate of water evaporation in the dark from the rate under one sun, one can determine the value of m.¹ Based on Figure 6c, the average rate of water evaporation for GJ-01(Cal) under one sun is 4.23 kg/m²/h. In the dark, the average rate of water evaporation at GJ-01(Cal) was calculated to be 2.82 kg/m²/h. Given that the value of L_{lv} is a function of temperature, we assume that the temperature at which water vapor is produced (47°C) is the same as the surface to be 2264.7 kJ/kg. The power of one sun illumination is 1kW/m². Therefore, it is possible to determine that the solar-to-vapor efficiency for GJ-01(Cal) nanocomposite is

$$\eta = \frac{(4.23 - 2.82)kg/h \times 2464.7kJ/kg}{1kW/m^2}$$
$$\eta = \frac{1.41kg/m^2/h \times 2464.7kJ/kg}{1kW/m^2}$$
$$\eta = \frac{\frac{1.41}{3600}kg/m^2/s \times 2464.7kJ/kg}{1kW/m^2} = 0.965$$

Efficiency% = $0.965 \times 100 = 96.5\%$



Figure S1: XRD pattern graphs of a) comparison of as-synthesized HKUST-1 with simulated HKUST-1, b) CNS



Figure S2: (a) UV-Visible spectra of HKUST-1 and CNS; and (b) Tauc plot of GJ-01(Cal)



Figure S3: SEM image of pristine HKUST-1



Figure S4: EDAX of GJ-01(Cal) nanocomposite



Figure S5: XPS Peak (a) Survey peak of HKUST-1(Cal) (b) Survey peak of CNS (c) Survey peak of GJ-01(Cal) (d) C1s spectra of CNS (e) C1s spectra for HKUST-1(Cal) (f) micro-raman spectra of HKUST-1 and CNS



Figure S6: FESEM images of (a) pristine cotton fibrils and (b) GJ-01(Cal) nanocompositecoated cotton fibrils



Figure S7: Photothermal conversion efficiencies of different materials



Figure S8: Stability of GJ-01(Cal) nanocomposite. Each cycle runs for 2 h

S.No.	Materials	Illumination Intensity (kW/m ²)	Evaporation rate (kg/m ² /h)	Conversion Efficiency (%)	Reference
1.	Cu nanodots embedded on Graphene matrix	1	0.68	82	2
2.	E-PNS _{BT-8}	1.13	1.529	90	3
3.	Co/CNS/M	1	1.393	93.39	4
4.	rGO/HN	1	1.48	89.2	5
5.	PAN@CuS	1	2.27	83.9	6
6.	GJ-01(Cal) coated on cotton fibrils	1	4.23	96.5	Our work

Table S1: Comparison table for GJ-01(Cal) over CF with other photothermal devices

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