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Supplementary Material

A cryogel solar vapor generator with rapid water replenishment and high intermediate water content for seawater desalination

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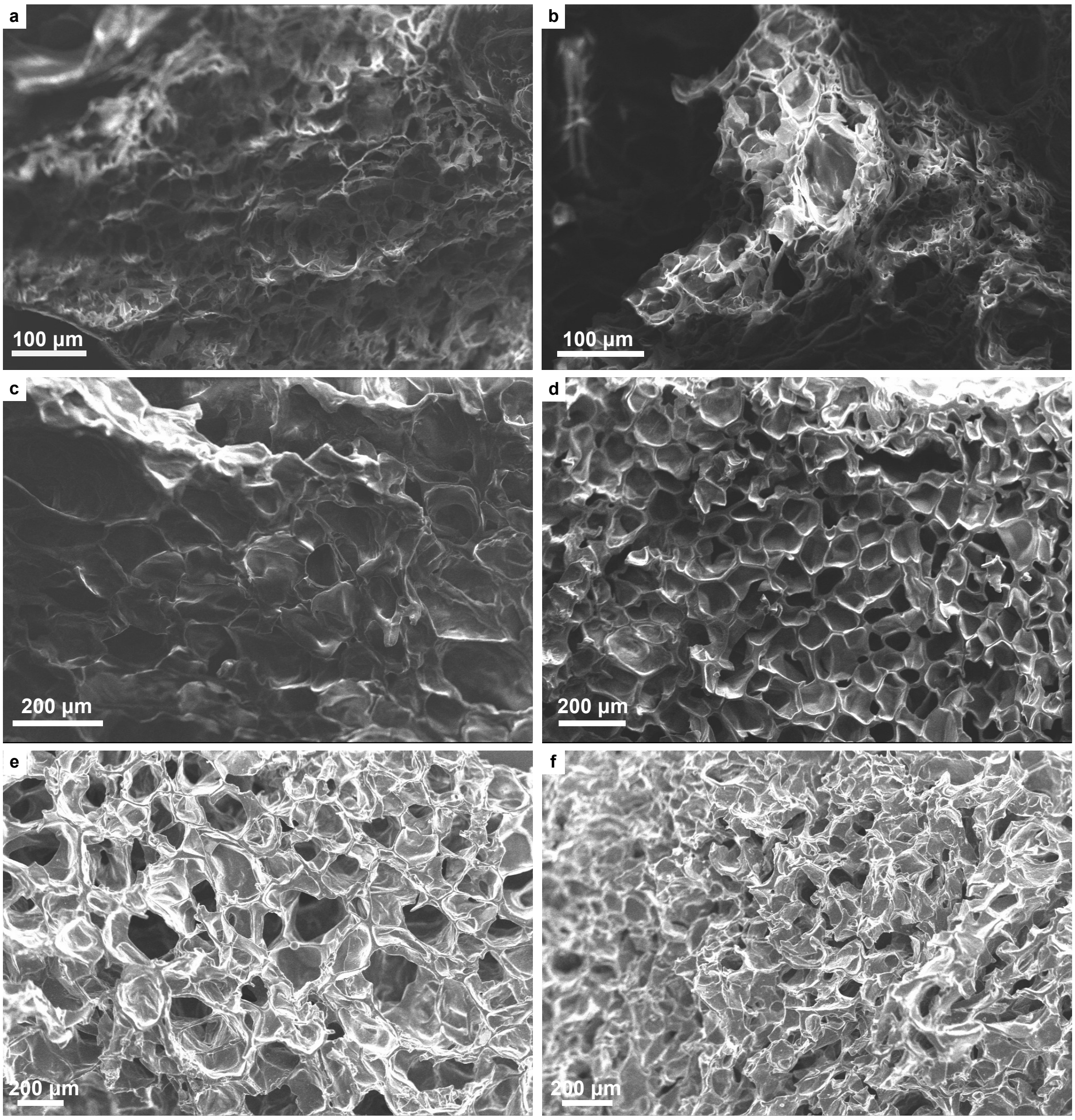

Figure S1. Cross-section SEM images of (a) PVA-GO-5, (b) PVA-GO-10, (c) PHEA-GO-5, (d) PHEA-GO-10, (e) PPEG-GO-5, and (f) PPEG-GO-10.

Table S1. The average pore size and wall thickness of all the samples calculated from the cross-section SEMs via '**Imagej**'.

Sample	**Average pore size (μm)**	**Average wall thickness (μm)**
PVA-GO-5	18.04	1.68
PVA-GO-10	5.69	2.93
PHEA-GO-5	108.22	5.71
PHEA-GO-10	97.96	11.82
PPEG-GO-5	130.52	10.24
PPEG-GO-10	78.70	18.00
PPEG-GO-10-LN	9.56	5.65

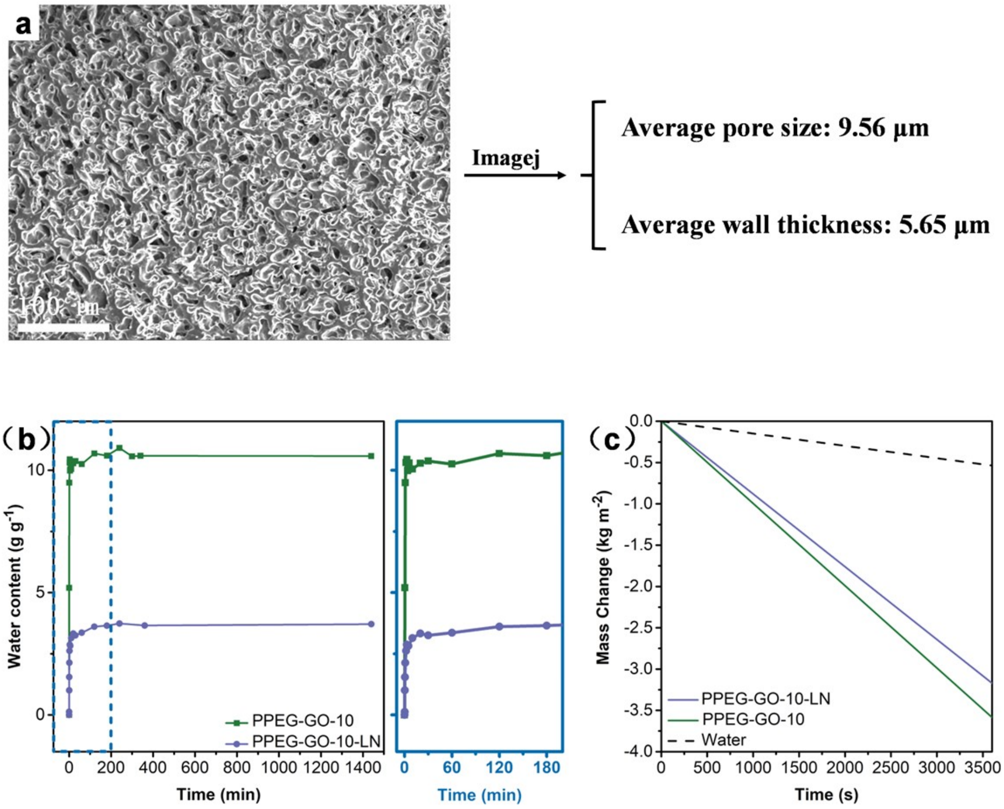

Figure S2. The porous structure, water uptaking capacity and solar vapor generation performance of PPEG-GO-10-LN. (a) Cross-section SEM images of PPEG-GO-10-LN. The average pore size and wall thickness calculated from the cross-section SEM via '**Imagej**' have been listed. (b) The water absorption of the PPEG-GO-10 and PPEG-GO-10-LN per gram of the corresponding dry sample plotted against water absorption time. (c) Water mass changes of PPEG-GO-10, PPEG-GO-10-LN, and the pure water during the solar vapor generation test under one sun irritation. All the data have been calibrated with dark evaporation data and were estimated by the slopes of the mass−time curve via linear fitting.

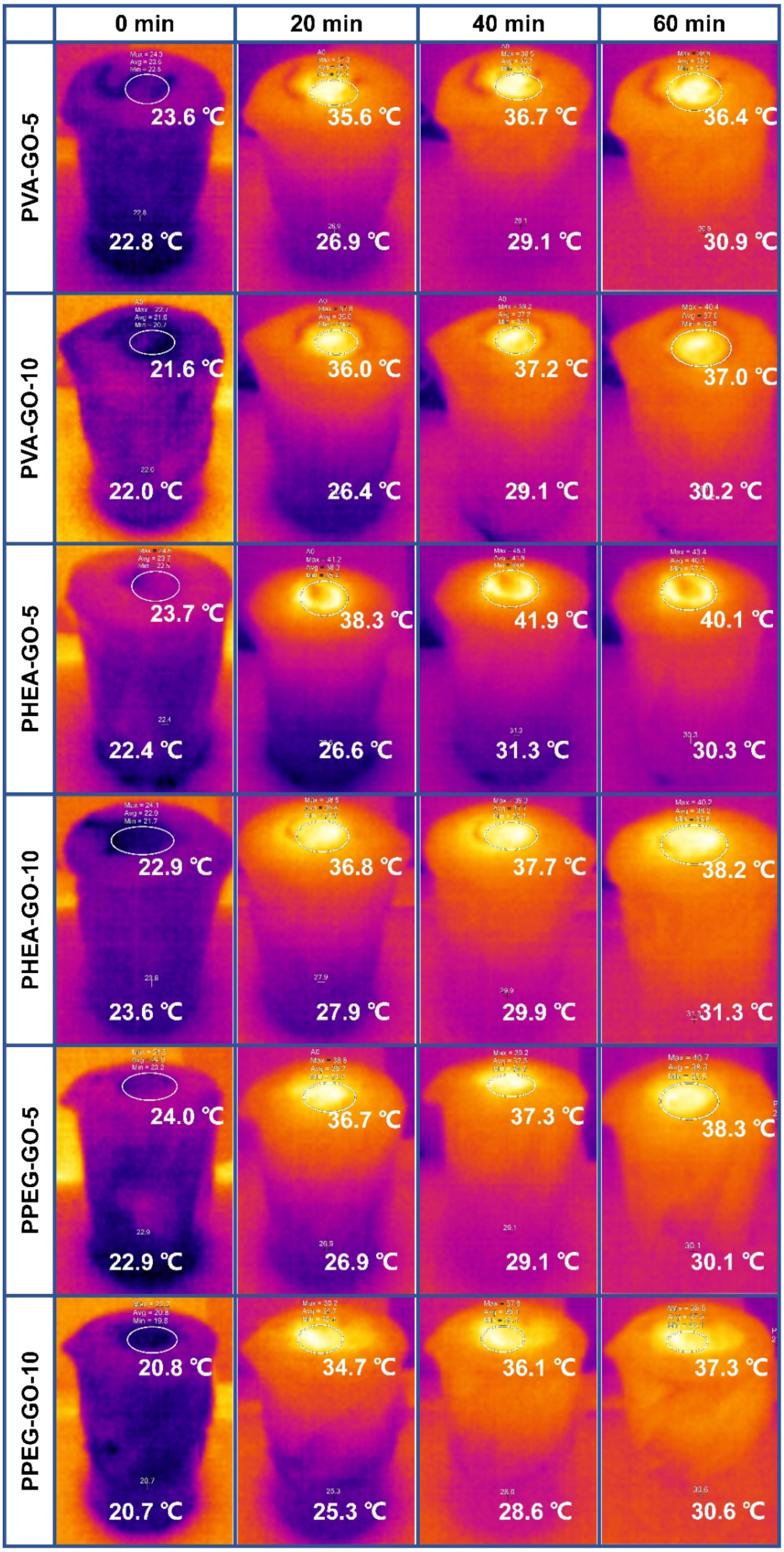

Figure S3. The infrared pictures of the samples at the 0 min, 20 mins, 40 mins and 60 mins during the SVG testing.

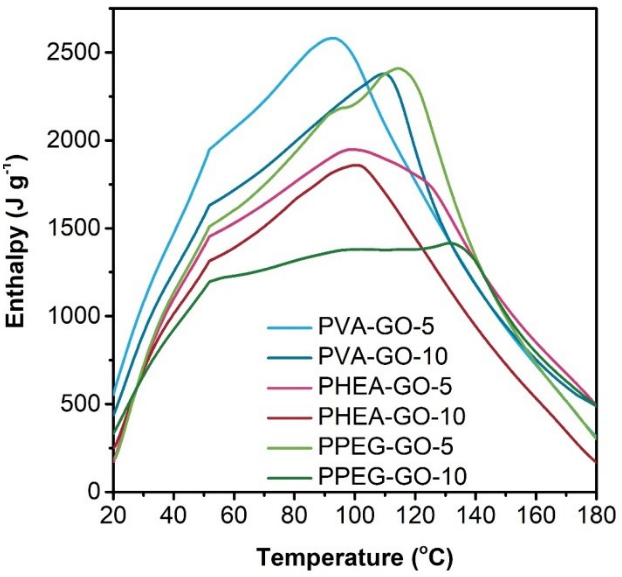

Figure S4. The calculated equivalent water evaporation enthalpy in the gel samples at various temperatures by DSC-TGA.

Table S2 The calculated equivalent water evaporation enthalpy in the gel samples at the surface equilibrium temperature.

Sample	**Surface equilibrium temperature (^{o}C)**	**Equivalent evaporation enthalpy (J g^{-1})**
PVA-GO-5	36.66	1348.89
PVA-GO-10	37.38	1172.16
PHEA-GO-5	40.1	1104.17
PHEA-GO-10	38.43	972.74
PPEG-GO-5	38.29	1076.25
PPEG-GO-10	37.27	861.54

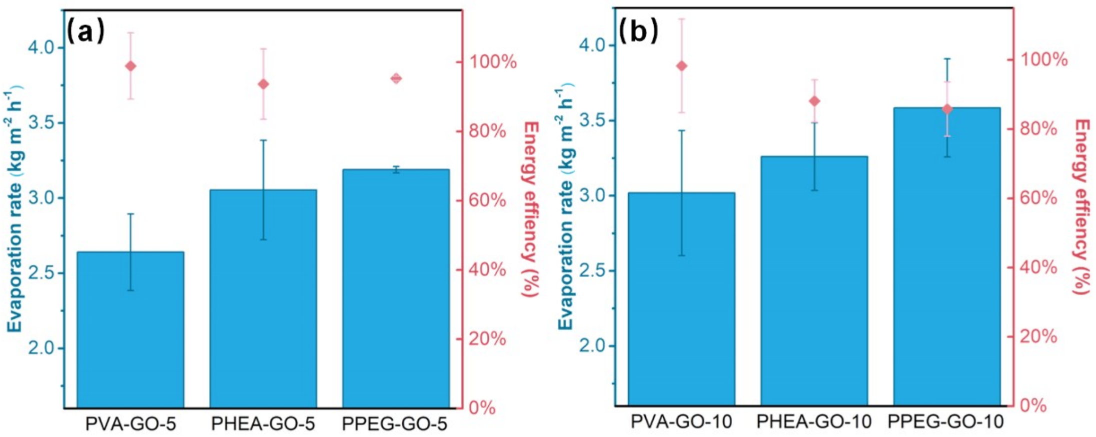

Figure S5. The evaporation rates and corresponding solar-thermal energy efficiencies of gels with (a) 5 wt% polymers and (b) 10 wt% polymers. We take the equivalent water evaporation enthalpy at the gel surface temperature for the calculation of energy efficiency. Each error bar shows the difference from at least two gel samples.

Figure S6. The photograph of the PPEG-GO-10 surface after desalination for 14 days.

Table S3. List of the SVG performance of the hydrogels in previous work with similar testing setup.

Materials	Evaporation rate (kg m^{-2} h^{-1})	Energy efficiency (%)	Ref.
Carbon dots chitosan/carboxymethyl cellulose hydrogel	1.4	89	1
Molybdenum carbide/carbon-based chitosan hydrogel	2.19	96.15	2
Sodium alginate/PEDOT:PSS 3D hydrophilic network	1.23	82	3
Bilayer PPy coating pre-pressed melamine foam	1.574	90	4
CNT/cellulose nanocrystals nanocomposite coated on the PDMS sponge	2.01	87.4	5
Benzoxazole-linked COF combined with the PDMS sponge	1.39	84.7	6
Agar/TiN cryogel	2.74	91	7
Agar hydrogel (AHG) with Prussian blue (PB) immobilized on cellulose nanofiber	2.22	84.3	8
PNAGA/chitosan/carbon nanotubes hydrogel	2.42	92	9
Bilayer lignin-PPy hydrogel	2.25	91.87	10
PVA/PEDOT:PSS hydrogel	2.5	90.7	11

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