Supporting Information

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Table S1 Contact angle of different films used in the experiment

Coatings	Contact angle (°)
SiNx:H	2.1
CuO	26.9
SiC	46.2
Cu-W	81.7
i-Si	92.4
PDMS	117.4
NC319 from Nano coating Company	138.7

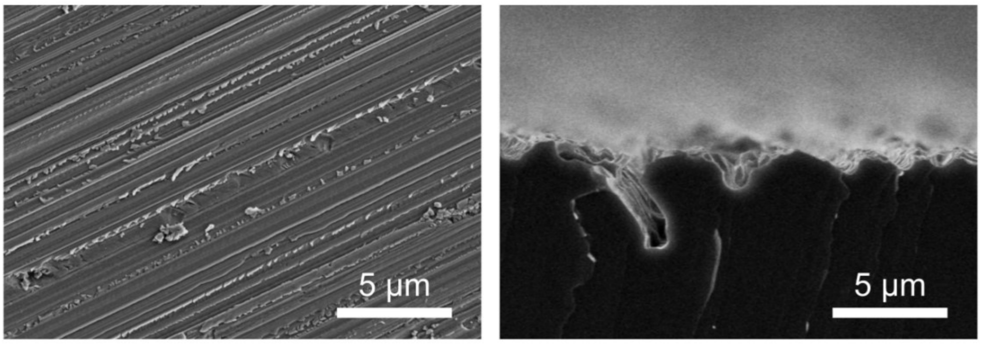

Figure S1 Topview and cross-section SEM images of the silicon substrate cut by the diamond wire cutting method

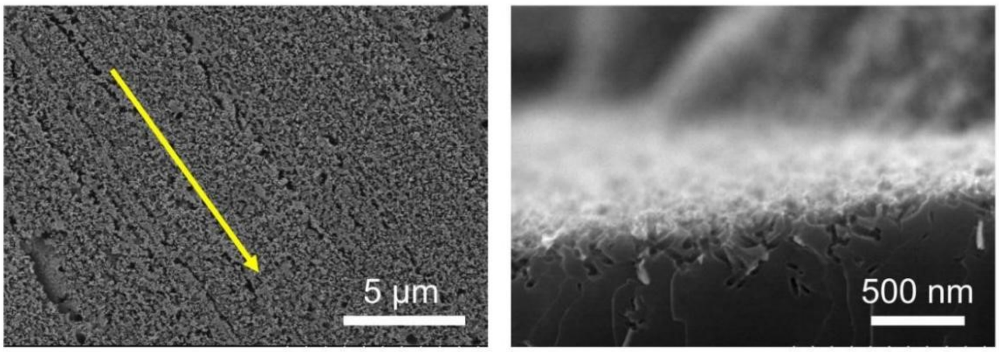

Figure S2 Top-view and cross-section SEM images of nanopores formed in the MACE process

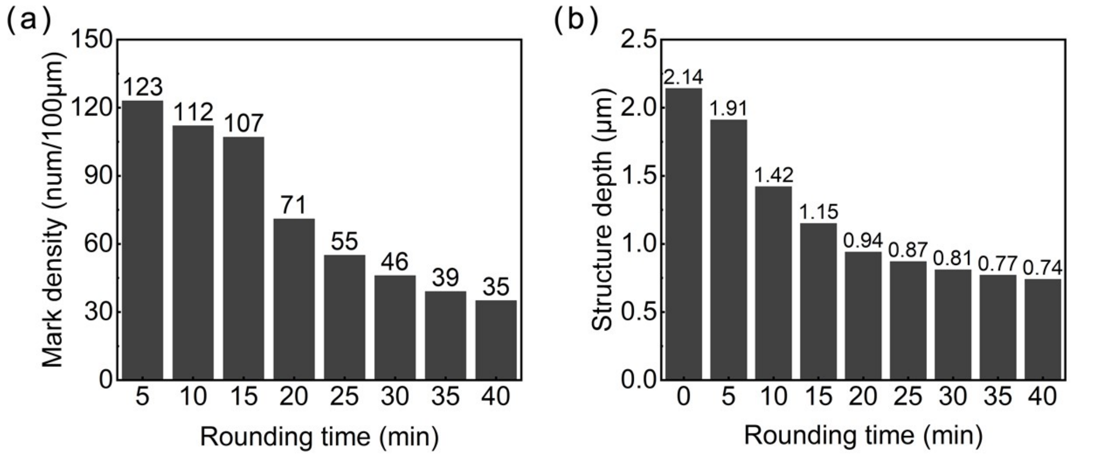

Figure S3 Mark density (a) and structure depth (b) with different rounding treatment time.

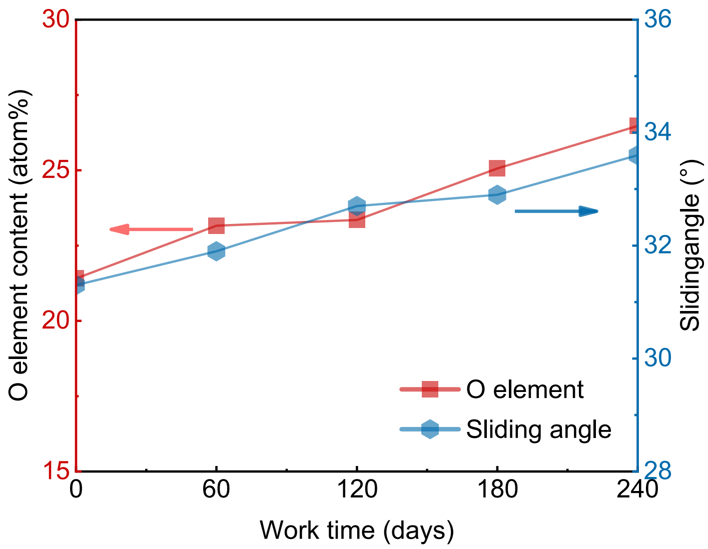

Figure S4 The change of O element content and sliding angle of RCEs in 240 days.

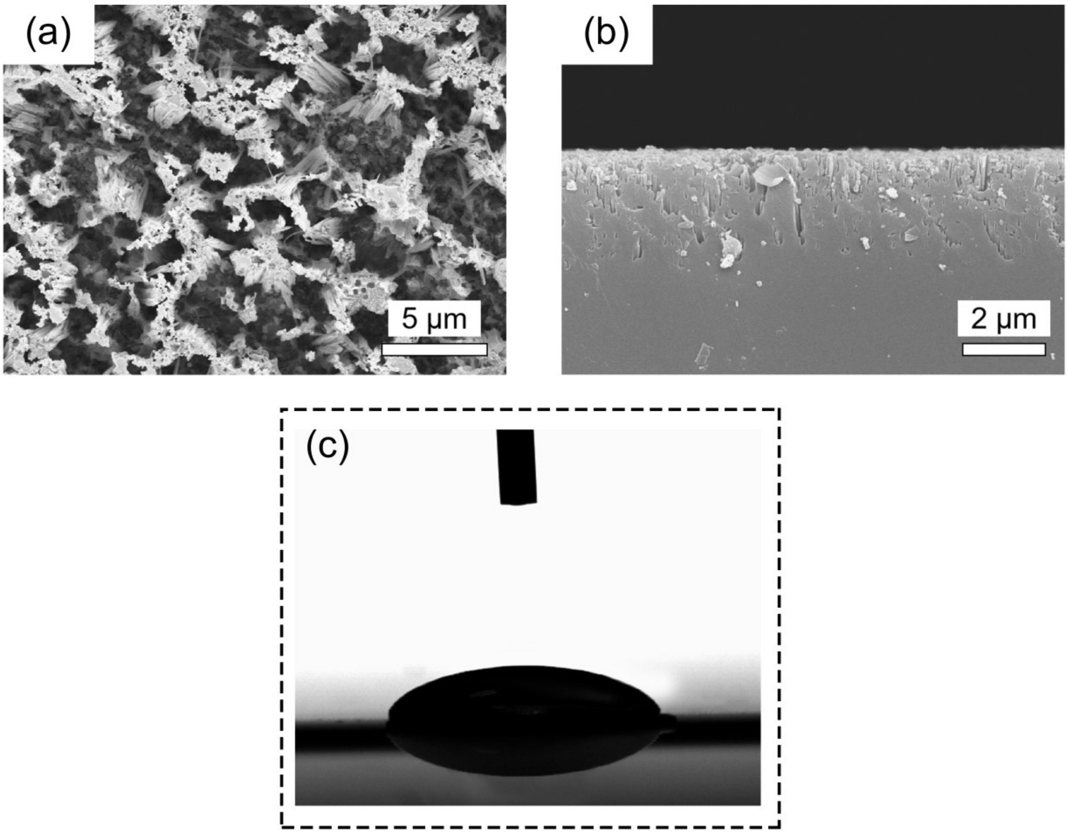

Figure S5 (a) Top-view and (b) cross-section SEM images, and contact angle image (c) of the controled RCE. Slide angle of the controled RCE is 62°.

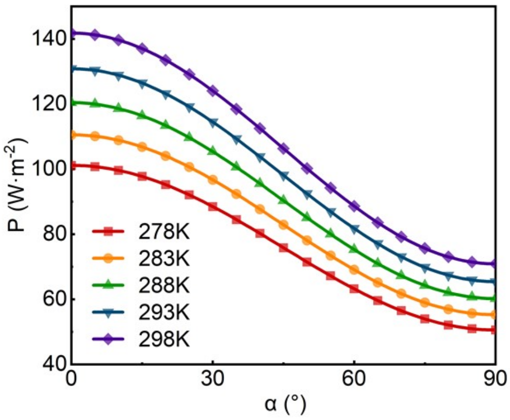

Figure S6 Cooling power curves of the ideal RCE with different inclination angle and temperature.

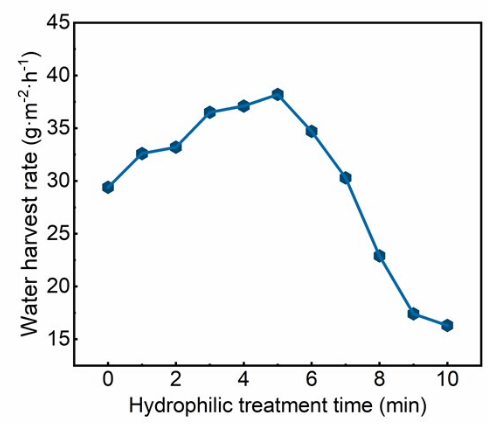

Figure S7 Water mass fluxes of the anisotropic RCE with different hydrophilic treatment time.

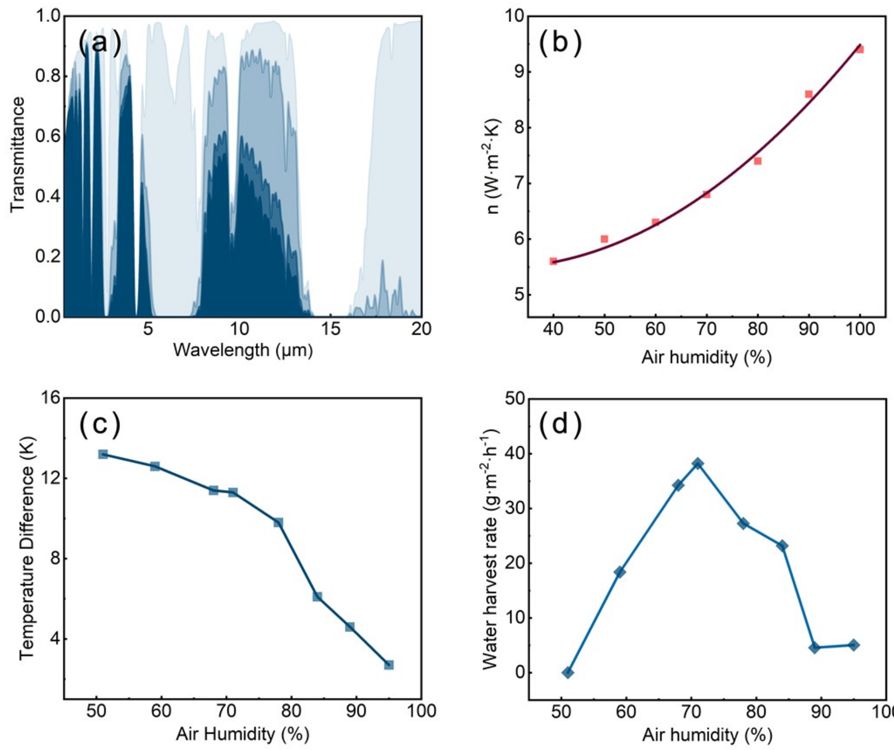

Figure S8 (a) the transmittance of the atmosphere with different water vapor contents; (b) non-radiative heat exchange coefficient between ambient and the RCE, (c) temperature difference and between ambient and the RCE, and (d) water mass fluxes in different air humidity.

The influence of air humidity on the efficiency of air AWH is also very significant. The modtran model is used to calculate the atmospheric transmittance under different atmospheric water content. With the increase of atmospheric water vapor content, the transmittance of the atmospheric transparent window in the wavelength range of 8-13 μm drops rapidly (shown in Fig.S8(a)). Under the standard condition of 1762 atm-cm, the average transmittance in the atmospheric transparent window range is 0.73; when the atmospheric water content increases to 5000 atm-cm, the average transmittance drops to 0.42. Atmospheric water content will weaken the cooling efficiency of RCE by changing the atmospheric transmittance in the wavelength range of 8-13 μm. Moist air will increase the non-radiative heat exchange between RCEs and the environment (shown in Fig.S8(b)), and suppress the radiative cooling temperature difference. The radiative cooling temperature difference shown in Fig.S8(c) proves the above-mentioned suppression effect. When the air humidity is greater than 85%, the radiative cooling temperature difference can no longer maintain water harvest.

For air harvest methods by artificial cold sources, the greater the relative humidity of the air, the higher water mass flux of AWH. But air harvest based on radiative cooling has additional variables. As shown in Fig.S8 (d), there is an extreme point in the water mass fluxes of AWH with air humidity, and 74% air humidity is the most suitable for AWH.

Relative saturated water vapor pressure in air depends on ambient temperature. It can be descipt

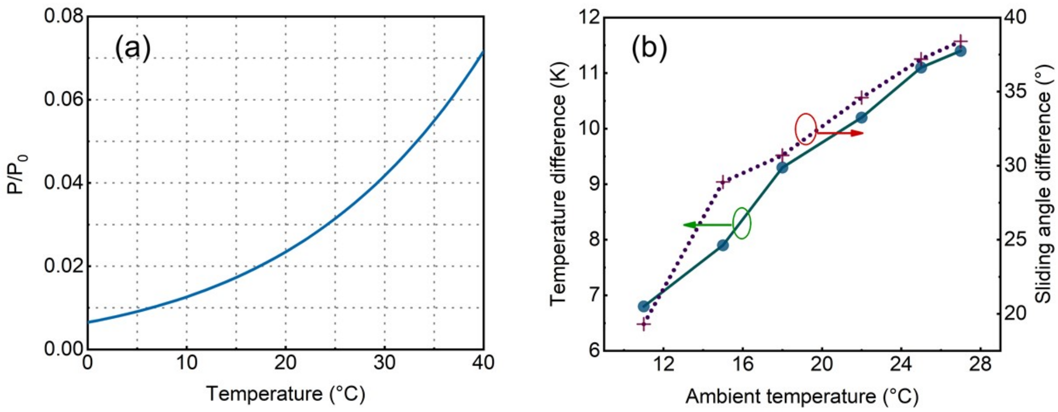

Figure S9 (a) The curve of the saturation partial pressure of water vapor in the air as a function of temperature

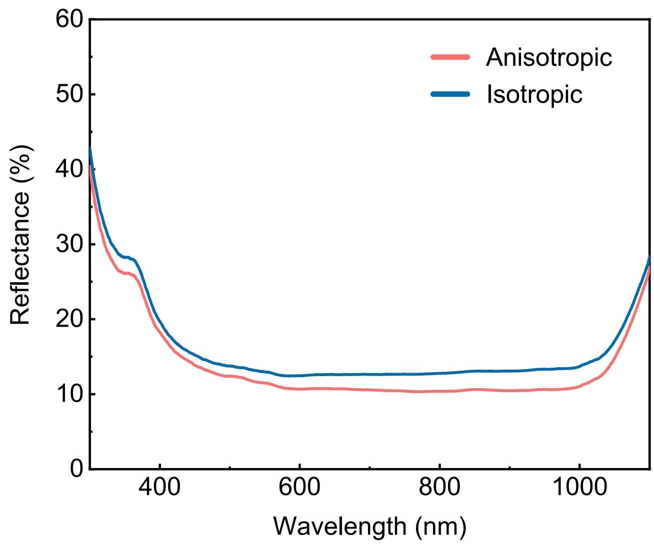

Figure S10 Reflectance spectrum of Anisotropic and Isotropic samples