Supporting information

Effect of Biphilic pattern type, size and wettability ratio on atmospheric water collection

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S1. Fabrication Process of Structured PDMS via Soft Lithography and Fog collection and dew collection performance

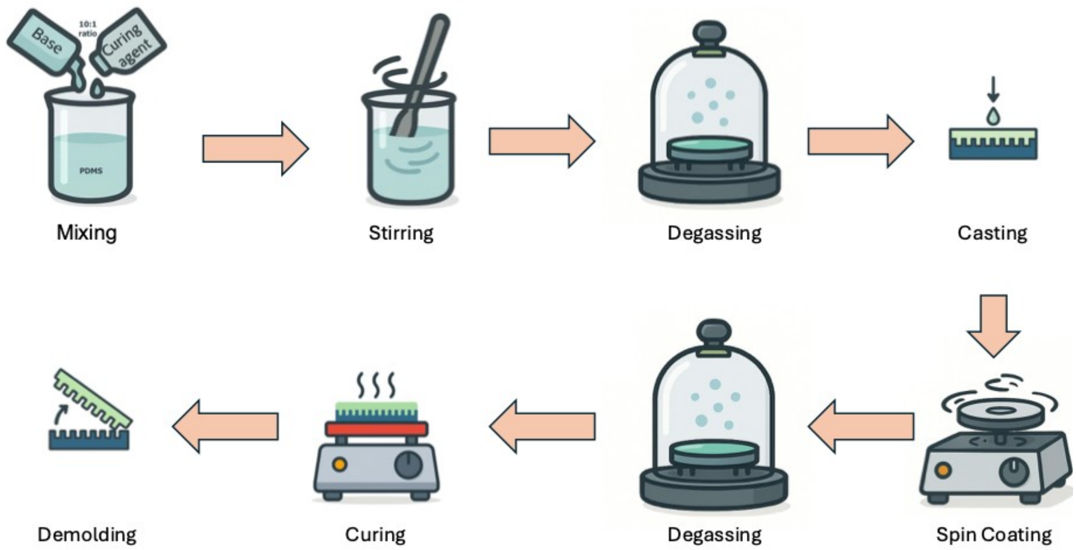


Figure S1: Fabrication Process of Structured PDMS via Soft Lithography

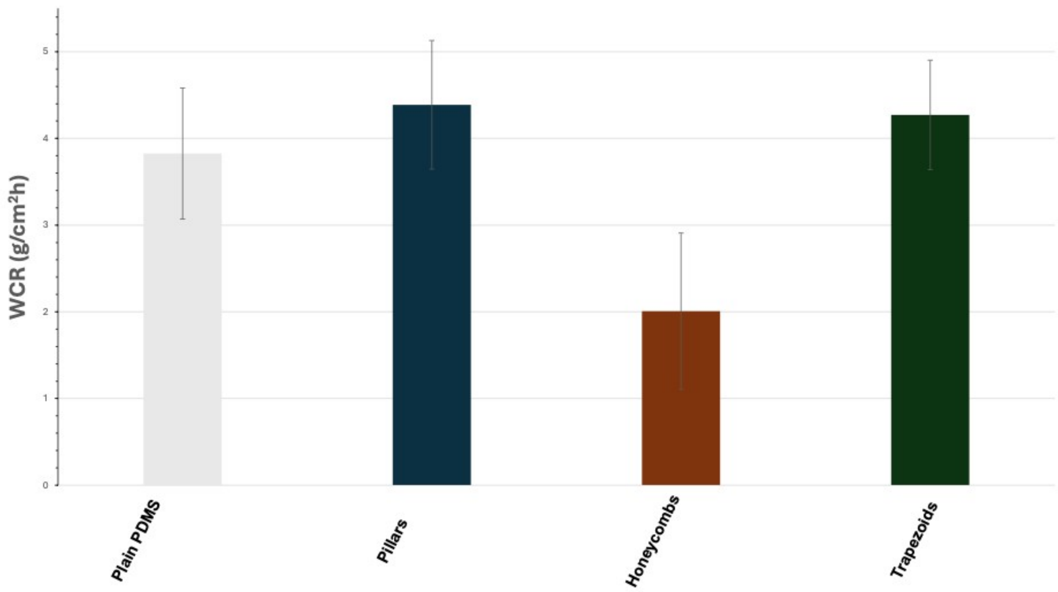
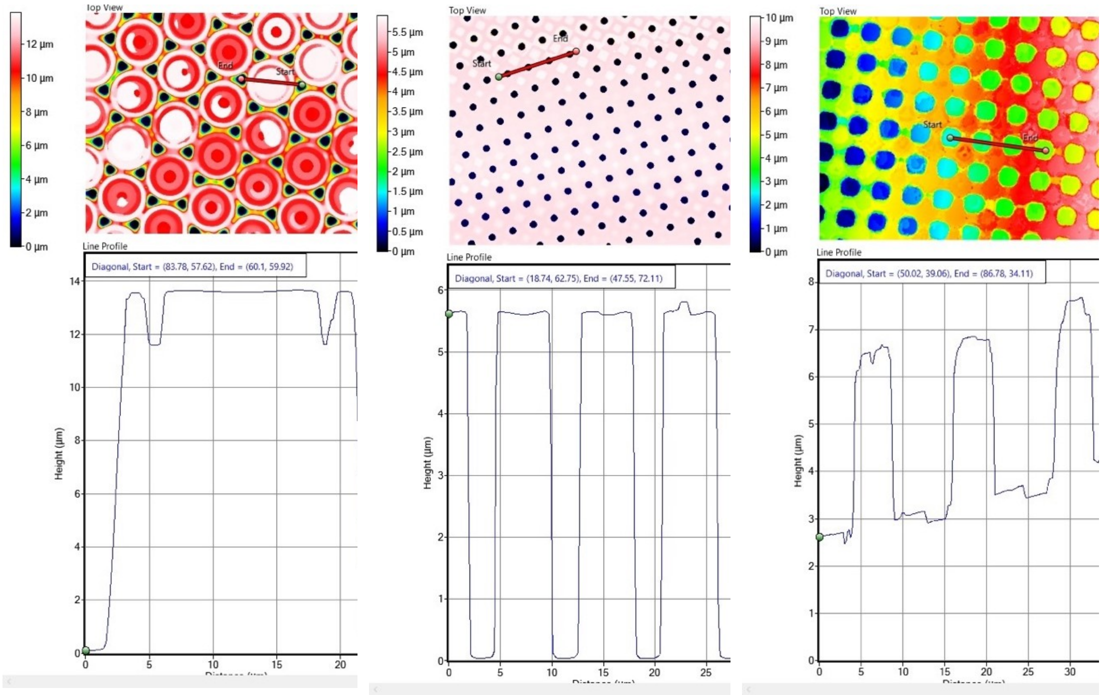


Figure S2. Fog collection rate in (g/cm^{2}h) for the hydrophobic and superhydrophobic surfaces realized with three different microtopographies.

Table S1: Dew collection performance and dominant governing mechanisms under the two extreme environmental scenarios

Condition	Best surface (background + pattern)	Hydrophilic coverage	WCR (g cm^{-2} h^{-1})	Gain vs PDMS	Dominant mechanism
70% RH / 15 °C	Parallel stripes 1000:2000 µm (Pillars)	35%	0.0417	+156%	Enhancement of the nucleation rate and continuous drainage
90% RH / 15 °C	1000 µm spots (Trapezoids & Pillars)	25%	0.0717	+54%	Large, discrete areas which increase nucleation sites density and therefore nucleation rate

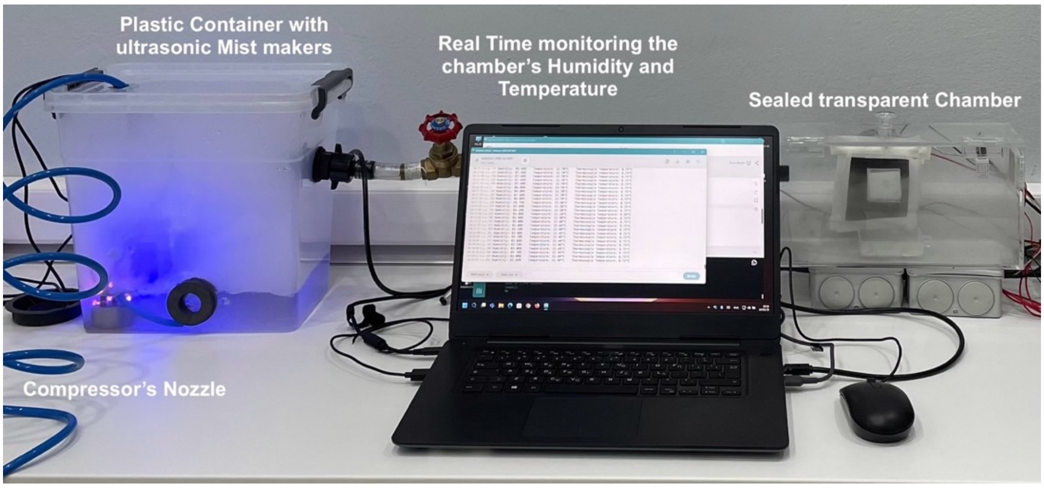
S2. Images acquired through 3D Optical profilometry (with their line profiles) of the Si masters



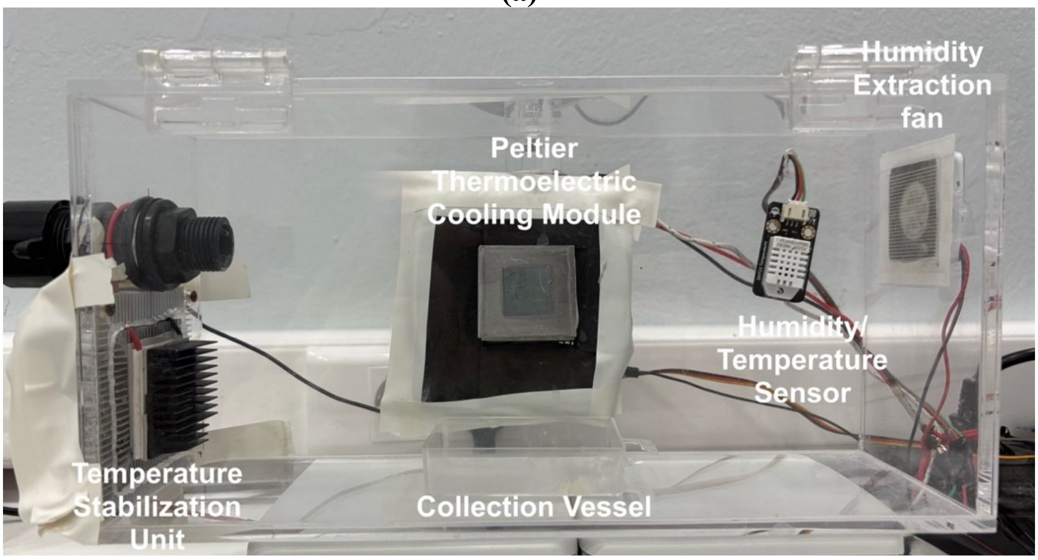
(a) **(b)** **(c)**

Figure S3: Images acquired through 3D Optical profilometry (with their line profiles) for **a)** large circular pillars (diameter is 18 µm and the depth 15 µm) **b)** small circular holes (diameter is 5µm and the depth 5 µm) **c)** trapezoids (square width is 7 µm and the depth 4 µm)

S3. Experimental Setups for the evaluation of Fog and Dew collection



(a)



(b)

Figure S4. The complete assembly of the dew collection set-up. (a) The system includes a plastic container with ultrasonic mist makers for fog generation, a sealed transparent chamber for controlled condensation, and a real-time monitoring interface to track humidity and temperature fluctuations throughout the experiment. (b) Image of the Condensation Chamber Interior: A high-magnification view of the dew harvesting environment. At the center, the Peltier Thermoelectric Cooling Module serves as the primary stage for sample temperature regulation, ensuring the biphilic surface remains below the dew point. The environmental conditions inside the chamber are tuned by a temperature regulation unit and a humidity regulation fan to prevent over-saturation. A calibrated Humidity/Temperature Sensor provides continuous monitoring of the conditions inside the chamber, and a rectangular collection vessel is positioned at the base to collect water.

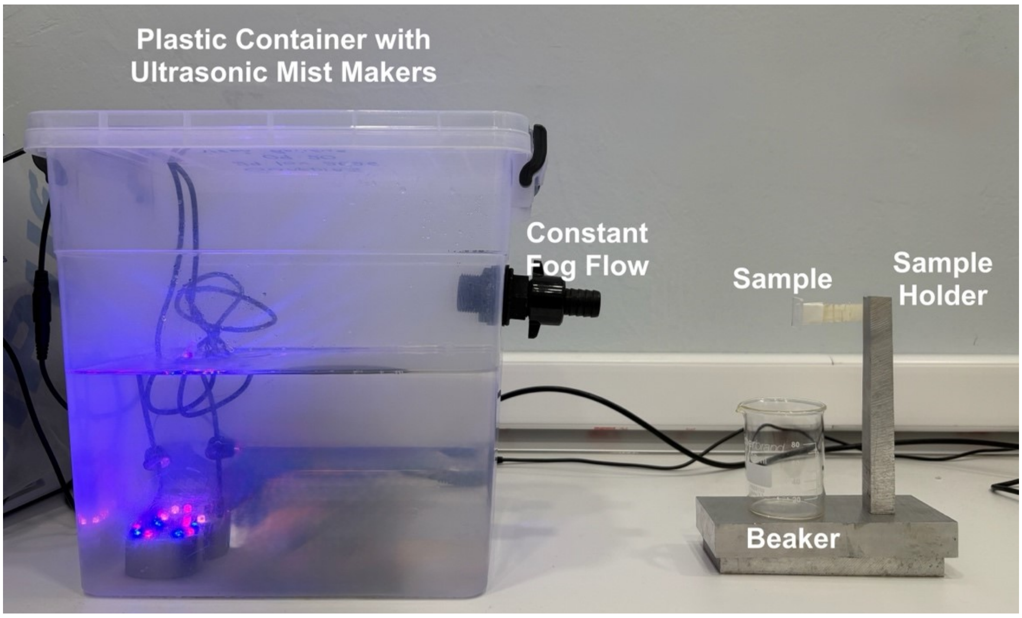


Figure S5. Image of the fog collection setup assembly, featuring a reservoir equipped with ultrasonic mist makers to produce a high-density fog. Mist delivery is managed through a constant fog flow nozzle, which ensures a uniform flux toward the vertically oriented sample. The sample is secured by a specialized sample holder, allowing droplets to coalesce and shed into a graduated collection beaker positioned at the base. Fog flow is monitored using a portable aerometer.