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Supporting Information for

Space-filling open microfluidic channels designed to collect water droplets

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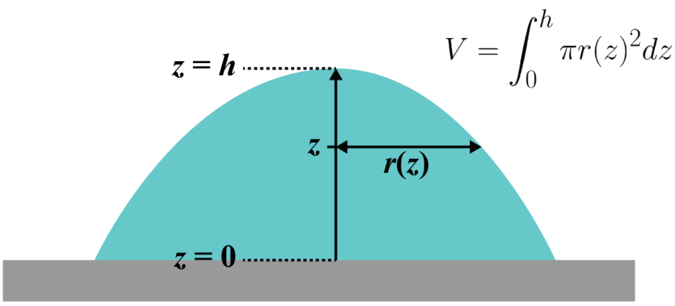


Fig. S1 Approximation of a droplet as a solid of revolution to calculate droplet volume.

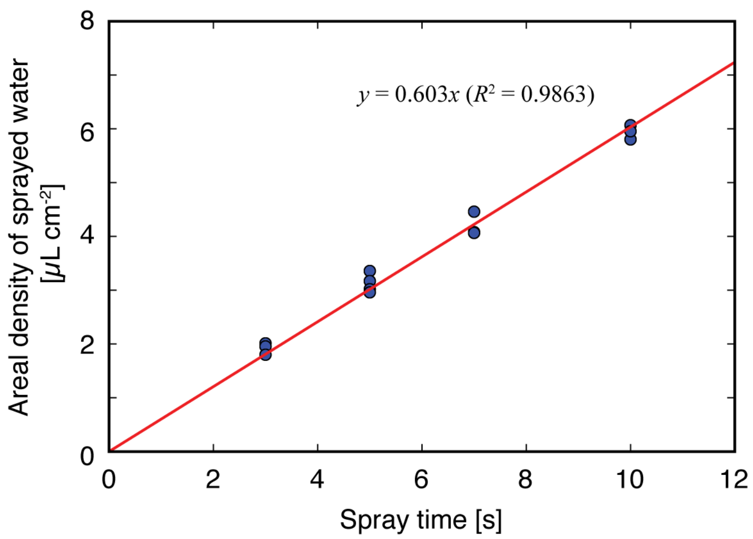
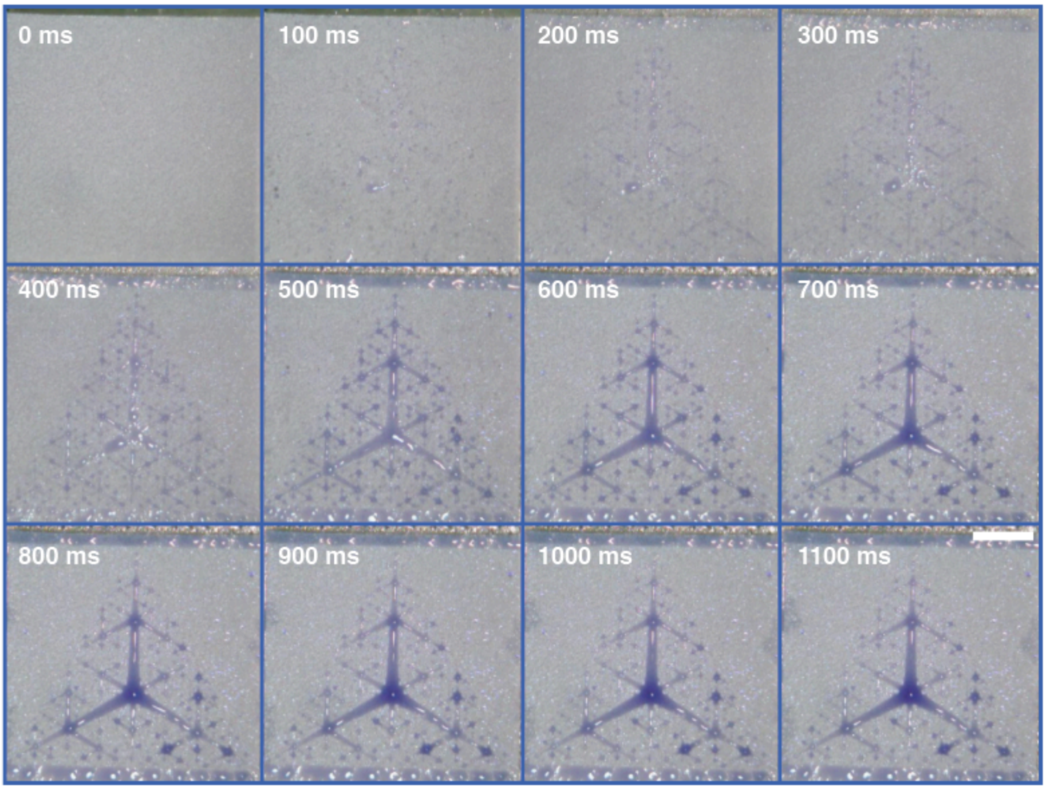


Fig. S2 Measurement of the spraying rate of water droplets.

a



b

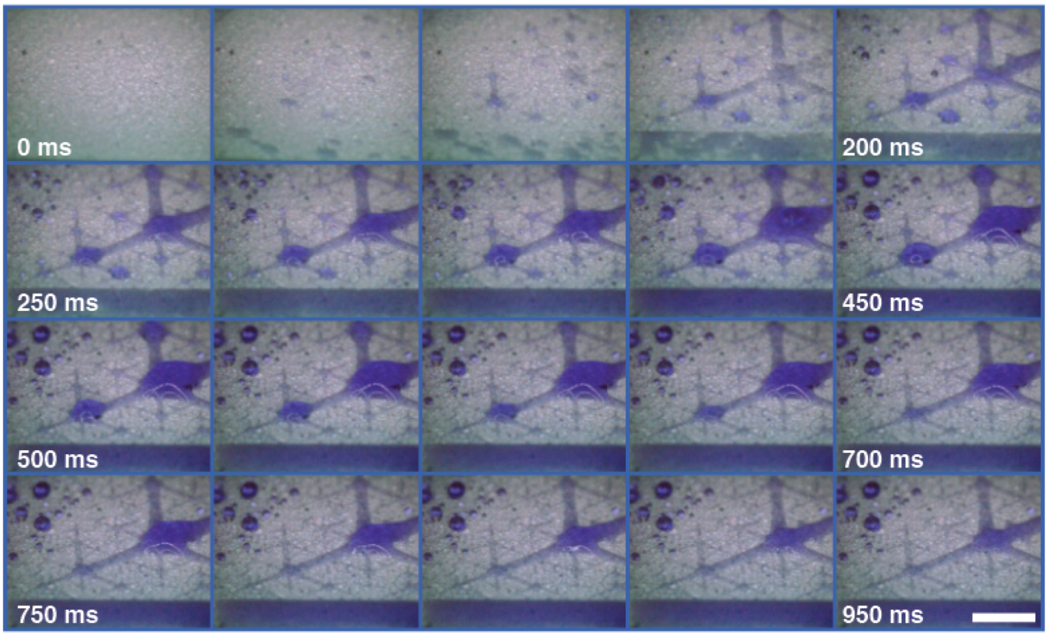


Fig. S3 Snapshots from high-speed microscopy of the process of droplet transport by the pattern with $G = 6$ and $\alpha = 5$. (a) The view of the entire film with water droplets sprayed until 0.7 s (Supplementary Movie 1). (b) The magnified perspective view of the film with water droplets sprayed until 0.6 s (Supplementary Movie 2). Scale bars are 5 mm (a) and 2 mm (b).

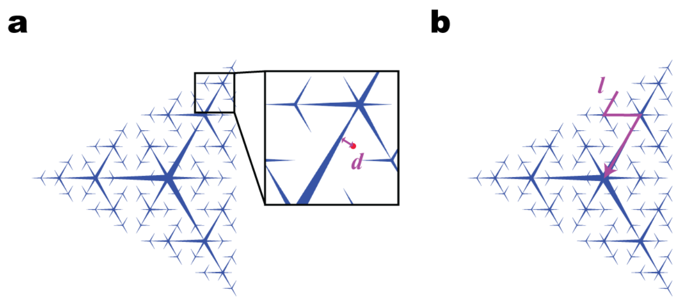


Fig. S4 Schematics illustrating the definitions of geometrical metrics. (a) Distance between a point and the closest superhydrophilic channel ($d_{x,y}$) and (b) path length ($l_{x,y}$).

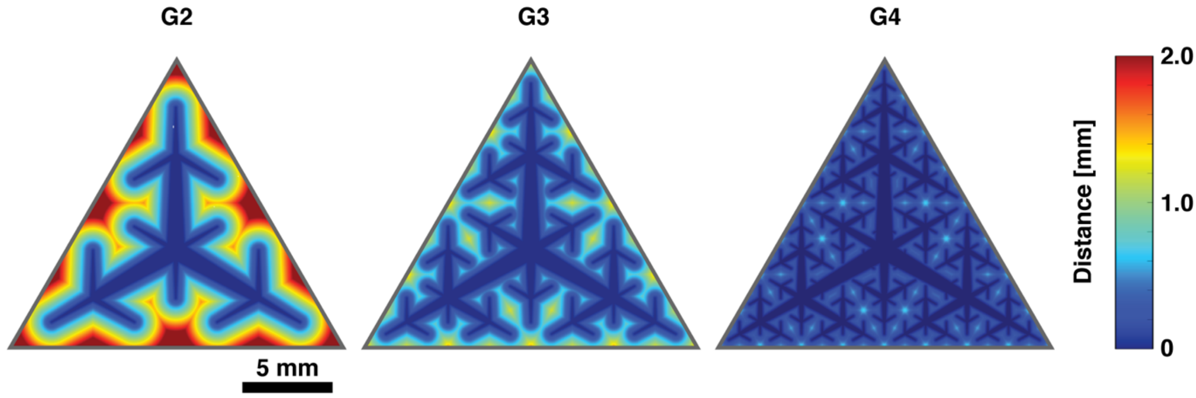


Fig. S5 A map of the distance to hydrophilic paths ($d_{x,y}$) for patterns with various G and α = 5°.

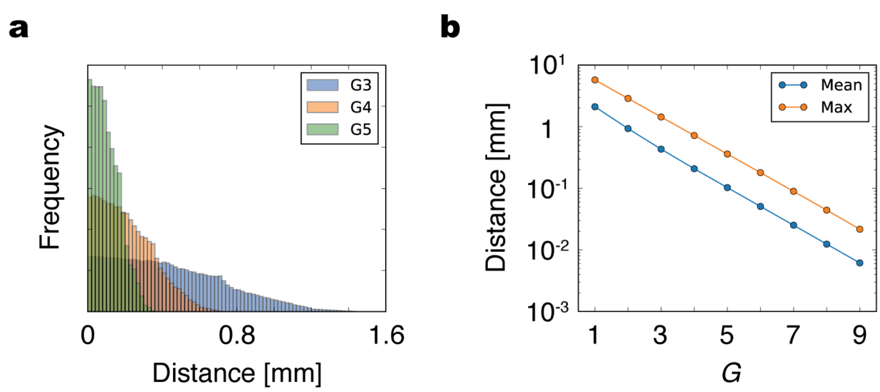


Fig. S6 Effects of G and α on the surface filling with superhydrophilic channels. The distance between a point (x, y) on the surface and the closest hydrophilic channel is defined as $d_{x,y}$. (a) Histogram of $d_{x,y}$ and (b) maximum and mean of $d_{x,y}$.

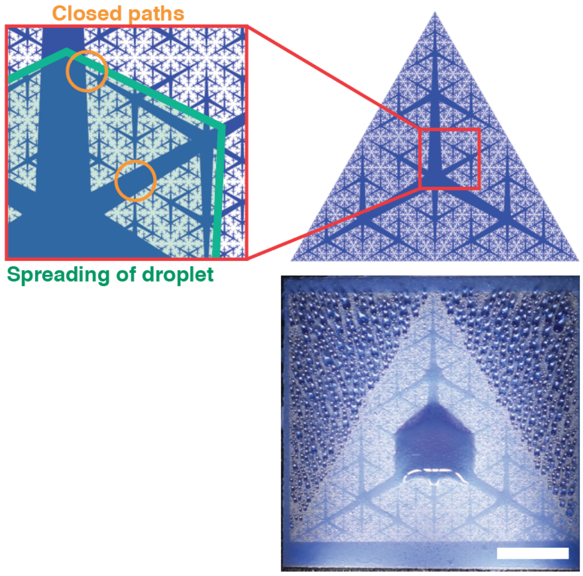


Fig. S7 (a) The pattern of G = 8 and $\alpha = 5$ that shows a closed superhydrophilic paths. (b) Spreading of water around the center at the pattern of G = 8 and $\alpha = 5$, sprayed with water for 15 s. Scale bar is 5 mm.

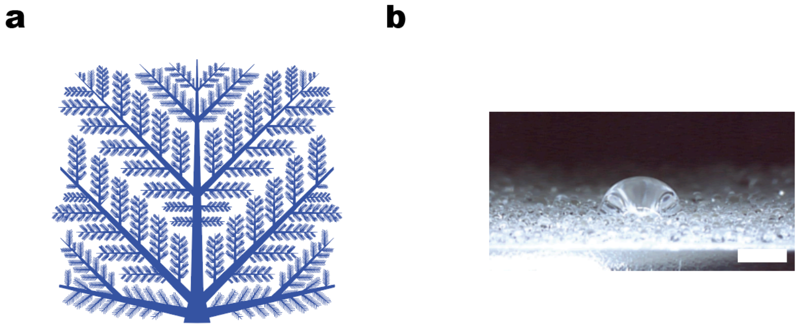


Fig. S8 (a) Replication of the non-fractal hierarchical pattern by Wang et al.[6] (b) The side view of the droplet collected by the pattern (a large water drop at the center) sprayed with colorless water droplet for 10 s. Scale bar is 1 mm.

Literature	Collection rate [µL cm^{-2} min^{-1}]	Water supply rate [µL cm^{-2} min^{-1}]	Collection efficiency	Method for water supply	Note
Ref. 1	13	253	5%	A fog flow from a nebulizer	Efficiency calculated by the assumption the mist contained saturated water at 25 °C.
Ref. 2	0.07	(No water flow)	N/A	Air of 12 °C with a water vapor pressure of 2800 Pa	No water flow was applied and the direct comparison is difficult.
Ref. 5	2.7	(No water flow)	N/A	Air of 35 °C, 80% relative humidity	The sample surface temperature was 18.2 ± 0.5 °C.
Ref. 7	46.3	Unknown	N/A	A fog flow with 75 cm s^{-2} velocity	
Ref. 8	50	4500	1%	A fog flow from a nebulizer	
Ref. 8	8	32	25%	Water droplets from a spray nozzle	Measured in the present work
Present work	27	36	74%	Water droplets from a spray nozzle	

Table S1 Comparison of water collection efficiencies between the present work and the previous reports.

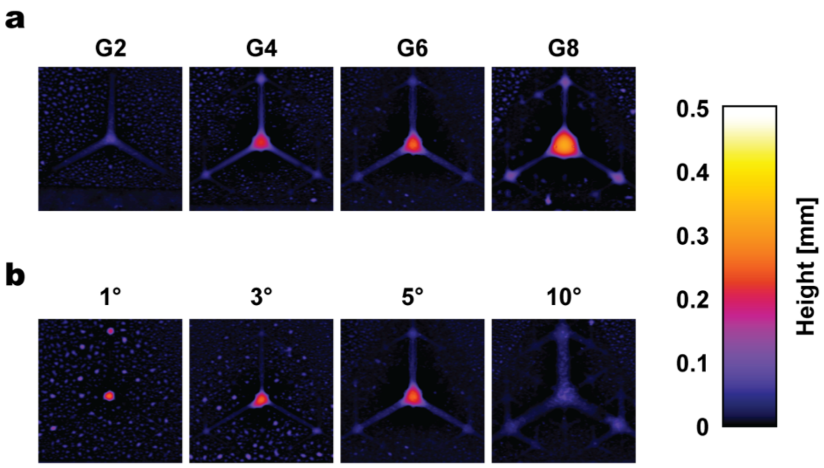


Fig. S9 Surface morphologies of liquid after spraying droplets on patterns with various *G* (a) and α (b) measured by a laser scanner.

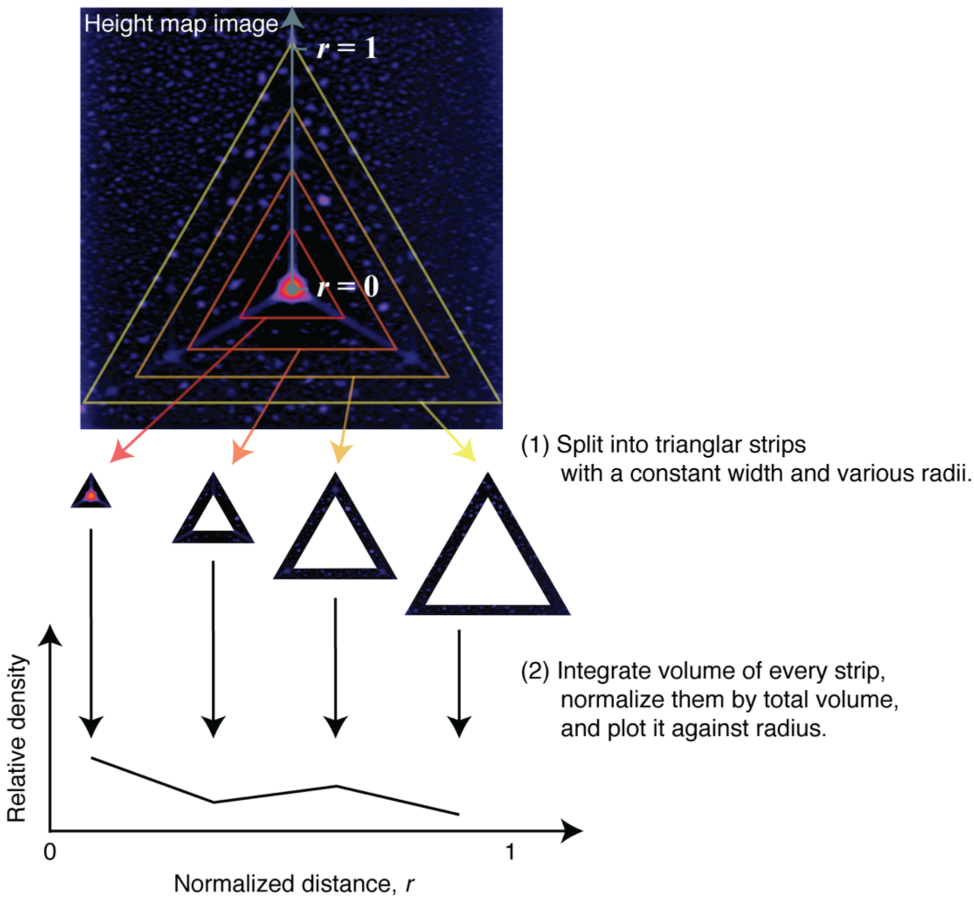


Fig. S10 Schematics illustrating the definition of a radial density profile.