Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information

Onset Time of Fog Collection

*Youhua Jiang, Christian Machado, Shaan Savarirayan, Neelesh A. Patankar, Kyoo-Chul Park**

Department of Mechanical Engineering, Northwestern University, Evanston, IL 60208, USA

* To whom correspondence should be addressed. E-mail: kpark@northwestern.edu

Materials and Methods

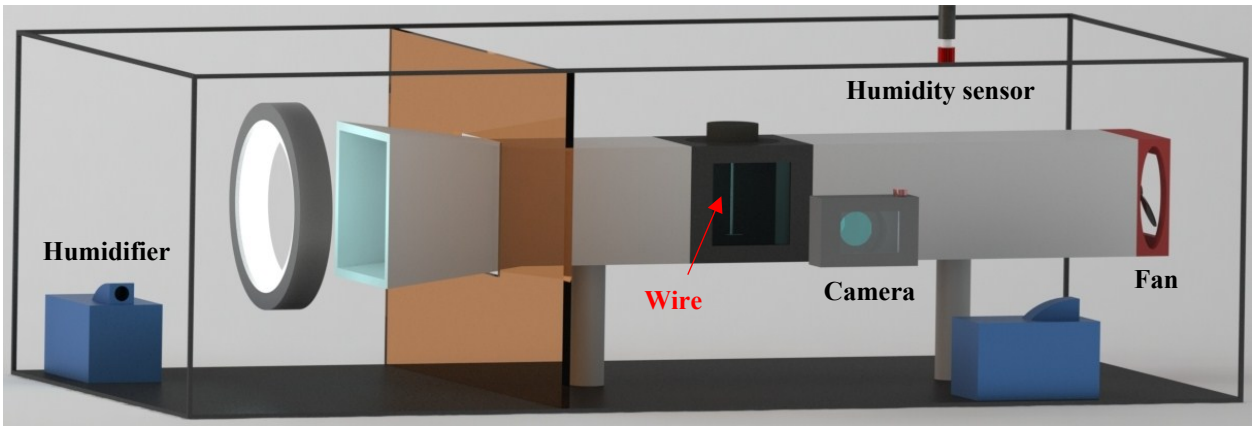

Fig. S1. Schematic of the experimental setup used in this study, including the environmental chamber, humidity sensor, wind tunnel, humidifiers, camera, and fan.

Preparation of aluminum wires with different wettabilities. Aluminum wires with eight different diameters of 0.33, 0.41, 0.51, 0.81, 1.02, 1.30, 1.63, and 2.06 mm were purchased from McMaster-Carr and cut to 50 mm in length. It should be noted that the effective wire length that was exposed to fog-laden flow was 40 mm. The aluminum wires were ultrasonically cleaned (Branson 3510, Buffalo Grove, IL, USA) with a detergent (Alcojet) for 30 minutes and then rinsed with deionized (DI) water. The cleaned aluminum wires served as the hydrophilic (Hphi) wires (**Fig. S2a**). Then, the cleaned wires were placed in a beaker of boiling DI water for 30 minutes to produce nanostructures (γ-AlOOH), in a process known as boehmitization. The nano-textured aluminum wires served as the superhydrophilic (SHphi) wires (**Fig. S2c**). The cleaned, un-boehmitized wires and those that were nano-textured were put into a solution (a weight ratio of ethanol to fluoroaliphatic phosphoric acid at 100: 1) under a temperature of 70°C (in an oven) for 30 minutes to deposit a hydrophobic coating on each wire's surface. The cleaned wires with hydrophobic coating served as the hydrophobic (Hpho) wires (**Fig. S2b**), while the nano-textured wires with hydrophobic coating served as the superhydrophobic (SHpho) wires (**Fig. S2d**).

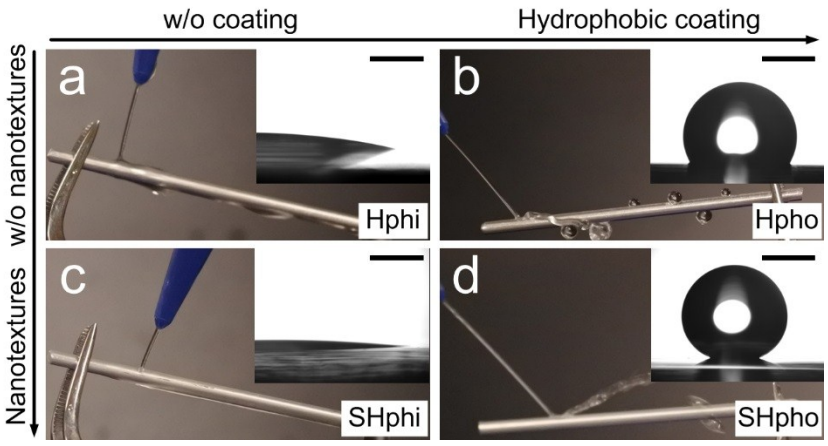

Fig. S2. Water droplet contact angles (~5 μL in volume) and the behaviors of water flow that have been jetted onto (**a**) hydrophilic, (**b**) hydrophobic, (**c**) superhydrophilic, and (**d**) superhydrophobic wires. The wire diameter is 2.06 mm. Scale bars are 1 mm.

Experiments were performed only at 0.5 m/s and 1.0 m/s to ensure that the captured water on superhydrophobic (SHpho) wires was not removed by the air flow (air drag force is less than the droplet-wire adhesion force). Averaged results of at least three reproducible trials were reported.

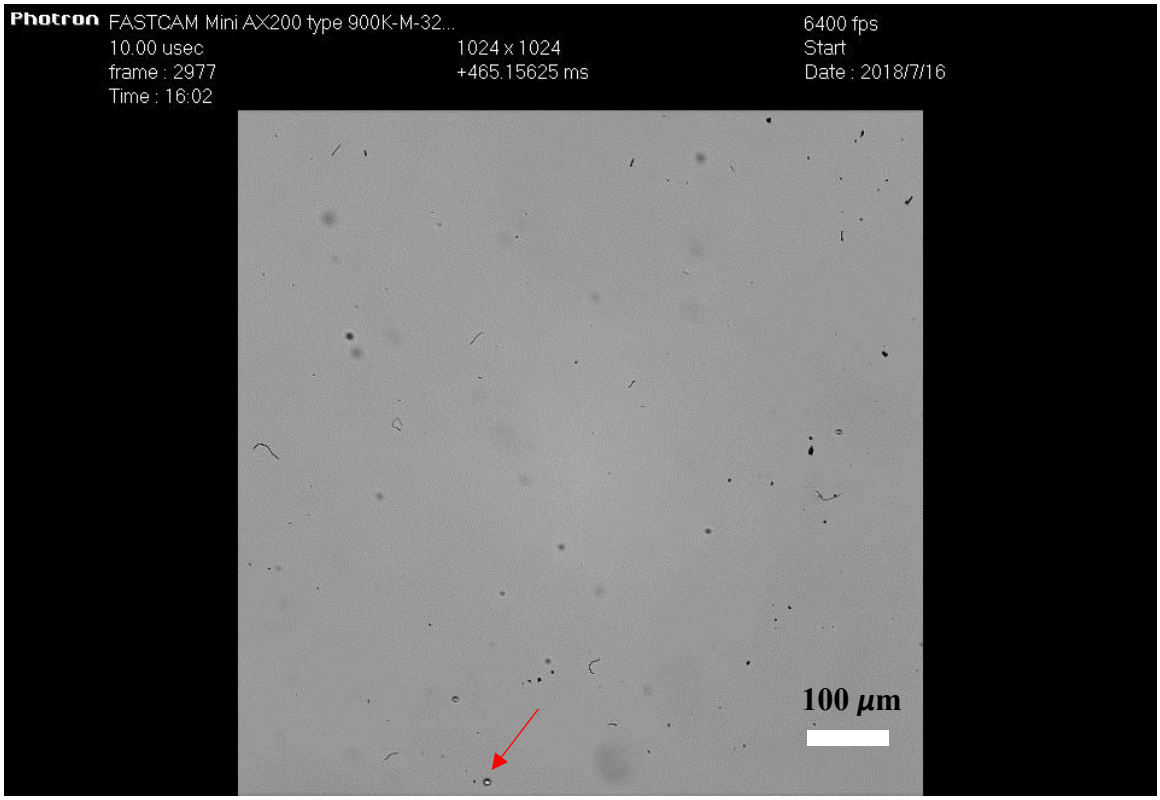

Fig. S3. Image of the fog particles captured by a high-speed camera (Photron Fastcam Mini AX200) at a frame rate of 6400 fps. Multiple images were taken and the average fog droplet radius was measured to be ~5 μm ± 1 μm.

Table S1. Measured advancing (θ_a) and receding (θ_r) contact angles of apparent droplets on hydrophilic, hydrophobic, and superhydrophobic wires.

d_{wire} (mm)	Hydrophilic		Hydrophobic		Superhydrophobic	
	θ_a (°)	θ_r (°)	θ_a (°)	θ_r (°)	θ_a (°)	θ_r (°)
0.33	80	60	140	100	165	130
0.41	80	60	120	80	165	130
0.51	60	50	120	80	165	130
0.81	45	20	120	80	165	130
1.02	45	20	120	80	165	130
1.30	45	20	120	80	165	130
1.63	45	20	120	80	165	130
2.06	45	20	120	80	165	130

It should be noted that there is an error bar (± 5°) for all the measured contact angles.

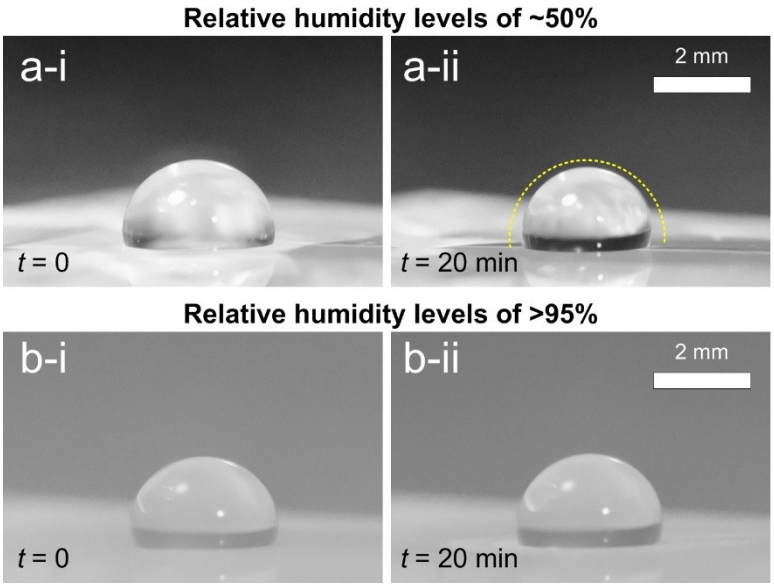

Fig. S4. Droplet profiles (**a-i**) before (t = 0) the wind flow of 1.0 m/s and (**a-ii**) 20 min after (t = 20 min) the wind flow, under the ambient condition (relative humidity level of ~50% in the laboratory). The yellow-dashed line indicates the droplet shape profile at t = 0. Droplet profiles (**b-i**) before (t = 0) the wind flow of 1.0 m/s and (**b-ii**) 20 min after (t = 20 min) the wind flow, under the controlled relative humidity level of >95% in the environmental chamber. The humidity was controlled by a humidifier in the environmental chamber that was placed far away from the inlet of the wind tunnel to prevent the direct deposition of droplets.