Supporting Information

Novel water tumbler with high floatation and adhesion using special wettability effects

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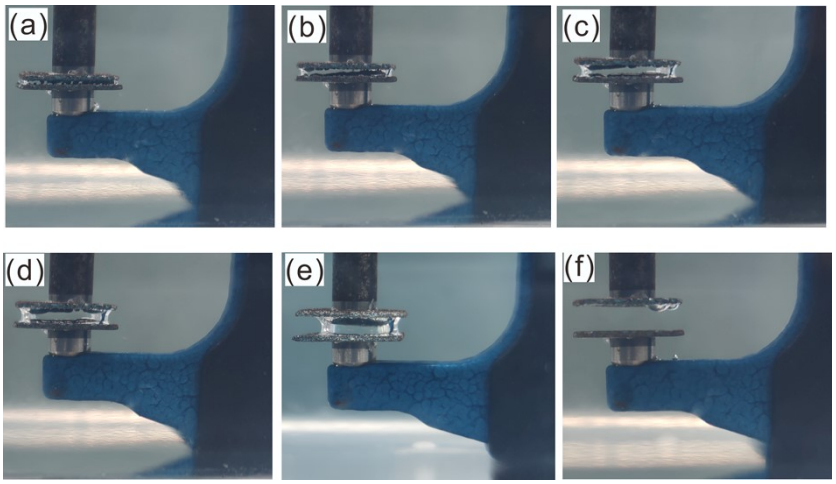

Fig. S1. Relationship between the morphology of the gas film and the distance (H) between the *SHB and SHB* surfaces. (a) H=0.5 mm, (b) H=1 mm, (c) H=1.5 mm, (d) H=2 mm, (e) H=2.5 mm, and (f) H=3 mm.

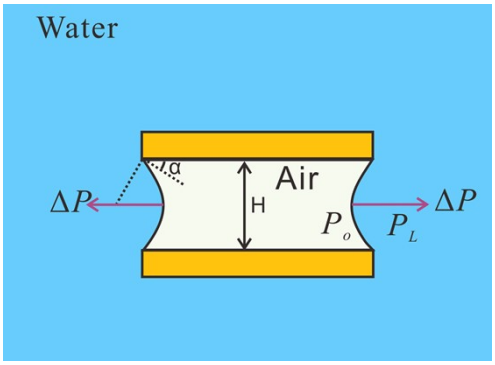

Fig. S2. Diagram illustrating the Laplace pressure

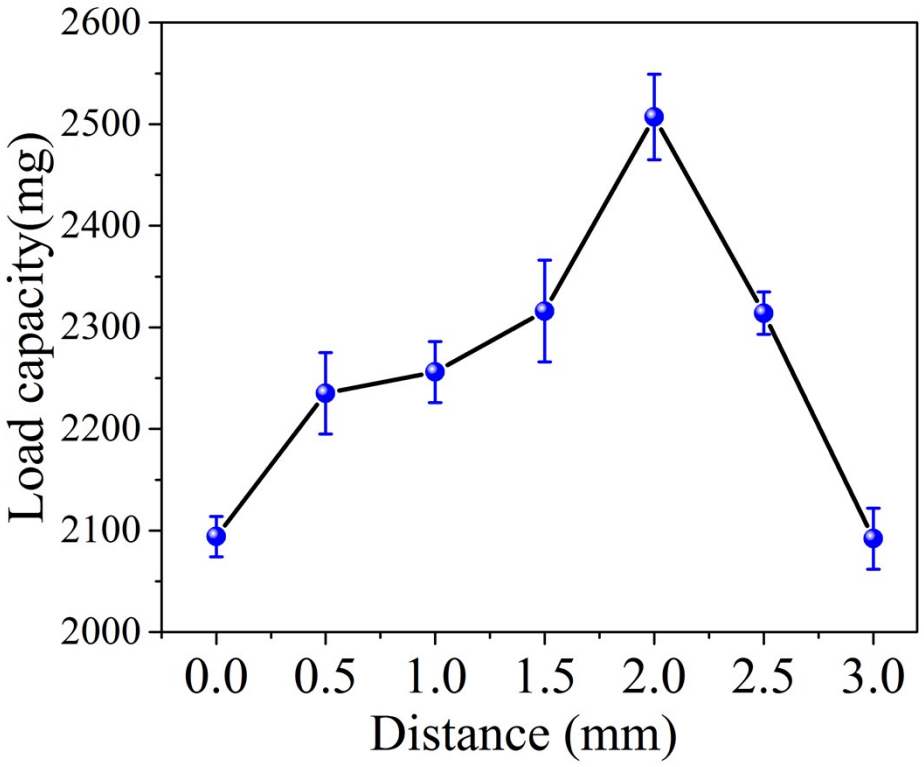

Fig. S3. Relationship between the load stability and the distance (H)

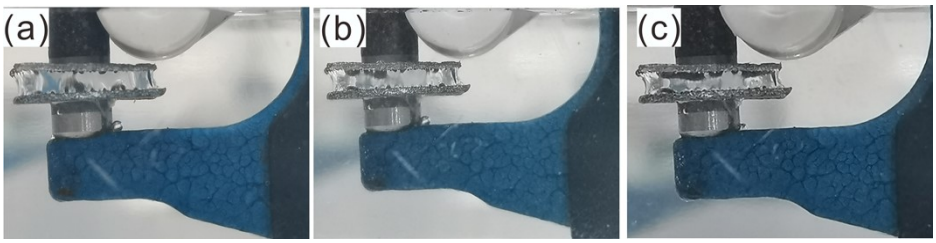

Fig. S4. durability test of the gas film. (a) 0 day, (b) 10 day, (c) 20 day

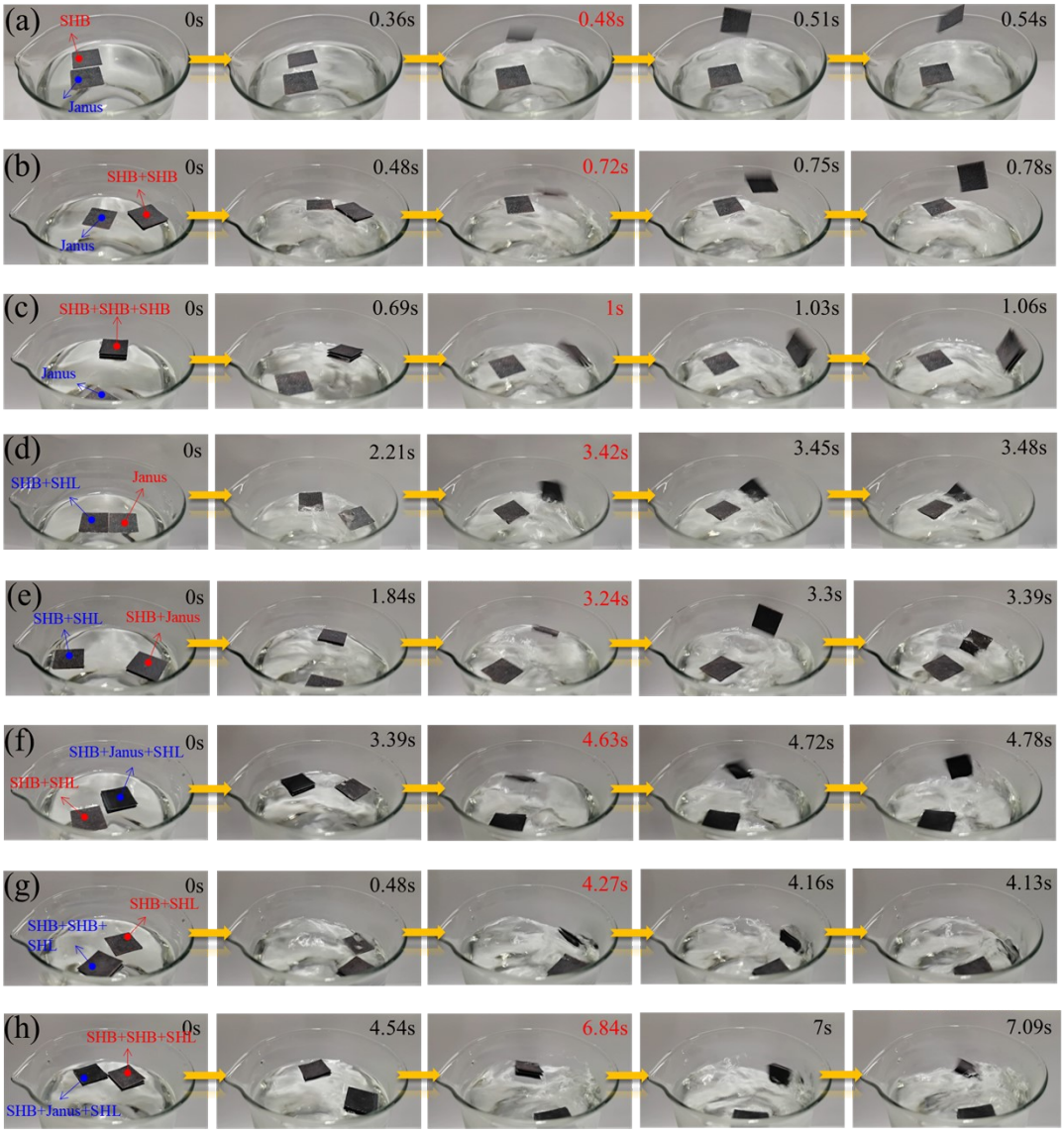

Fig. S5. Anti-wind experiment.

(a) The comparison experiment between Janus and SHB shows that SHB leaves the water surface at 0.48s, indicating that Janus has better water surface stability and greater adhesion to water than SHB.

(b) The comparison experiment between Janus and SHB+SHB shows that SHB+SHB leaves the water surface at 0.72s, indicating that Janus has better water surface stability and greater adhesion to water than SHB+SHB. At the same time, because the weight of SHB+SHB is greater than SHB, it takes longer for SHB+SHB to leave the water surface than SHB.

(c) The comparison experiment between Janus and SHB+SHB+SHB shows that

SHB+SHB+SHB leaves the water surface at 1s, which shows that Janus has better water surface stability and greater adhesion to water than SHB+SHB+SHB.

(d) The comparison experiment between SHB+SHL and Janus shows that Janus leaves the water surface at 3.42s, which shows that SHB+SHL has better water surface stability and greater adhesion to water than Janus.

(e) The comparison experiment between SHB+SHL and SHB+ Janus shows that SHB+ Janus leaves the water surface at 3.52s, indicating that SHB+SHL has better water surface stability and greater adhesion to water than SHB+ Janus.

(f) The comparison experiment between SHB+ Janus +SHL and SHB+SHL shows that SHB+SHL leaves the water surface at 4.63s, indicating that SHB+ Janus +SHL has better water surface stability and greater adhesion to water than SHB+SHL

(g) The comparative experiment between SHB+SHB+SHL and SHB+SHL shows that SHB+SHL leaves the water surface at 4.27s, indicating that SHB+SHB+SHL has better water surface stability than SHB+SHL.

(h) The comparison experiment between SHB+ Janus +SHL and SHB+SHB+SHL, SHB+SHB+SHL is off the water surface at 6.84s, indicating that SHB+ Janus +SHL has better water surface stability and greater adhesion to water than SHB+SHB+SHL.

Through the above comparative experiments, it can be found that as the number of super-hydrophilic surfaces in the module structure increases, the adhesive force of the assembly structure to water is greater, and the stability of the assembly structure on the water surface is stronger. Because SHB+ Janus +SHL has the most super-hydrophilic surfaces, this assembly structure has the greatest adhesion to water and the best stability on the water surface.

Movie S1

Auto-returning demo, SHB+Janus+SHL always has the super-hydrophobic side up, even if it is forced to flip, it will easily snap back up.

Movie S2

Rollover demo. No matter how the SHB+Janus+SHL ship model is overturned, it can always return to its normal state. However, ordinary foam boats can easily fall over.

Movie S3

Demonstration of anti-storm. The SHB+Janus+SHL ship model is always stable in the wind and waves, but the foam boat is easy to capsize.