Electronic Supplementary Material (ESI) for Nanoscale.
This journal is © The Royal Society of Chemistry 2019

Supplementary Information

A scalable, self-healing and hot liquid repelling superamphiphobic spray coating with remarkable mechanochemical robustness for real-life applications

Yihan Sun [a,c] and Zhiguang Guo [a,b,*]

[a] State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, People's Republic of China.

[b] Ministry of Education Key Laboratory for the Green Preparation and Application of Functional Materials, Hubei University, Wuhan 430062, People's Republic of China.

[c] University of Chinese Academy of Sciences, Beijing 100049, People's Republic of China.

* Corresponding author.

E-mail addresses: zguo@licp.cas.cn (Z. Guo).

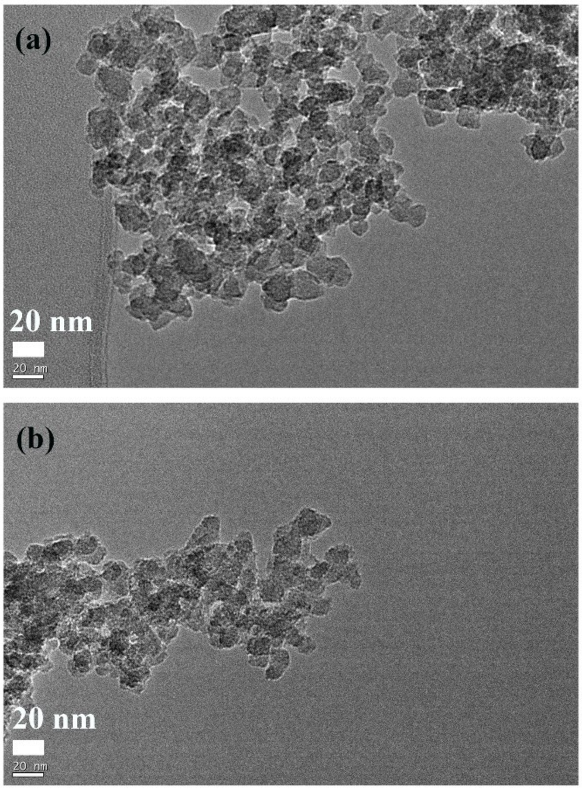

Figure S1. TEM images of pristine silica nanoparticles (a) and modified silica nanoparticles (b).

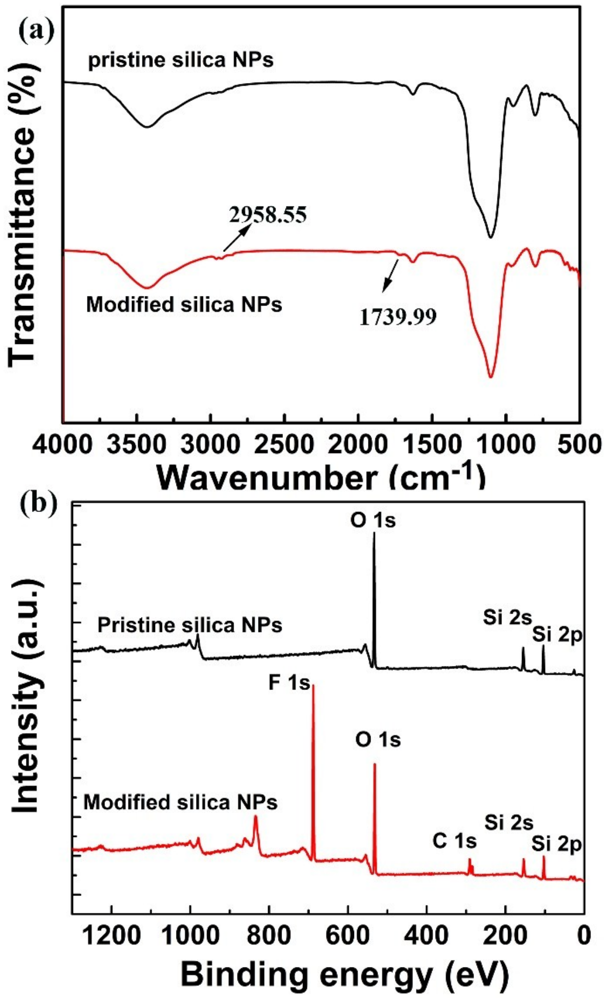

Figure S2. (a) The FTIR results of pristine silica nanoparticles and modified silica nanoparticles. (b) The XPS survey spectra of pristine silica nanoparticles and modified silica nanoparticles.

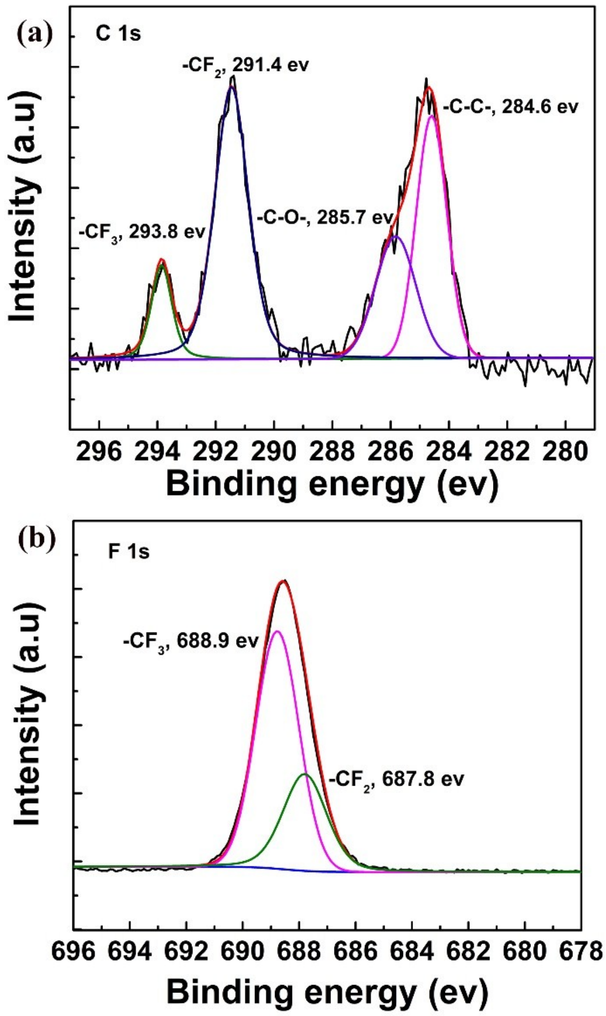

Figure S3. The high-resolution C 1s (a) and F 1s (b) XPS spectra of coating on glass.

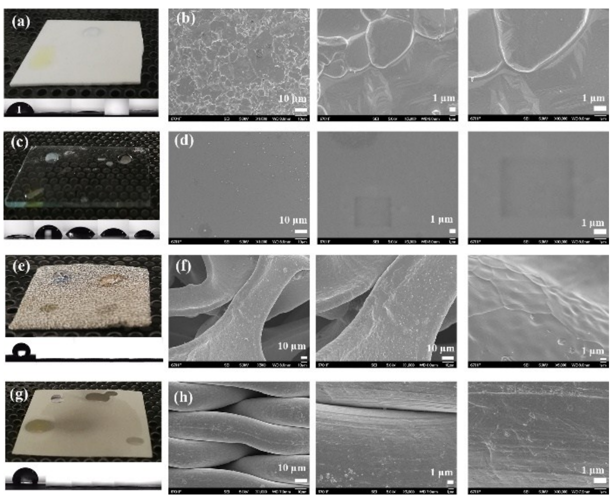

Figure S4. The photographs of original ceramic (a), glass (c), nickel foam (e) and stainless-steel-mesh (g). (b, d, f, h) The SEM images of original ceramic (b), glass (d), nickel foam (f) and stainless-steel-mesh (h).

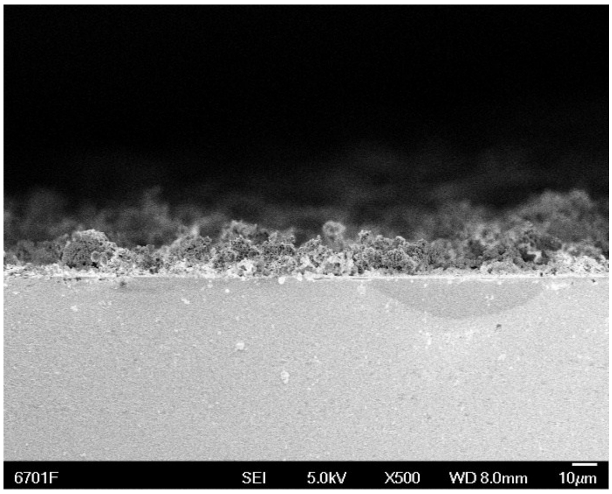

Figure S5. The cross-section view of obtained superamphiphobic glass.

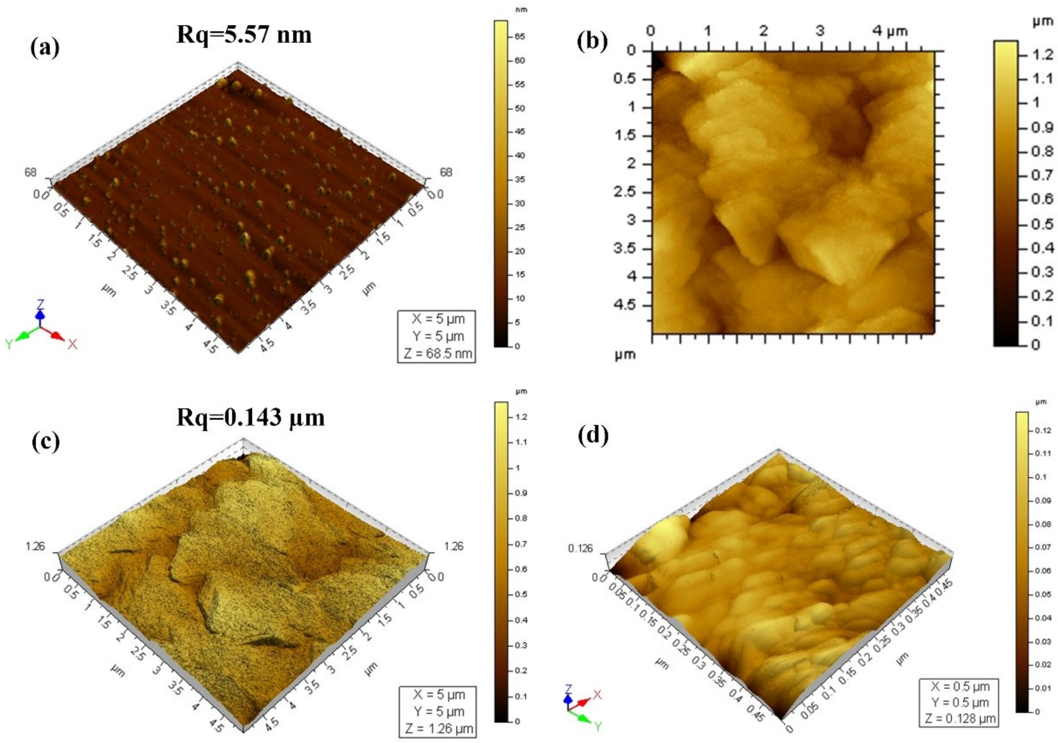

Figure S6. The AFM images of pristine glass (a) and coated glass (b-d).

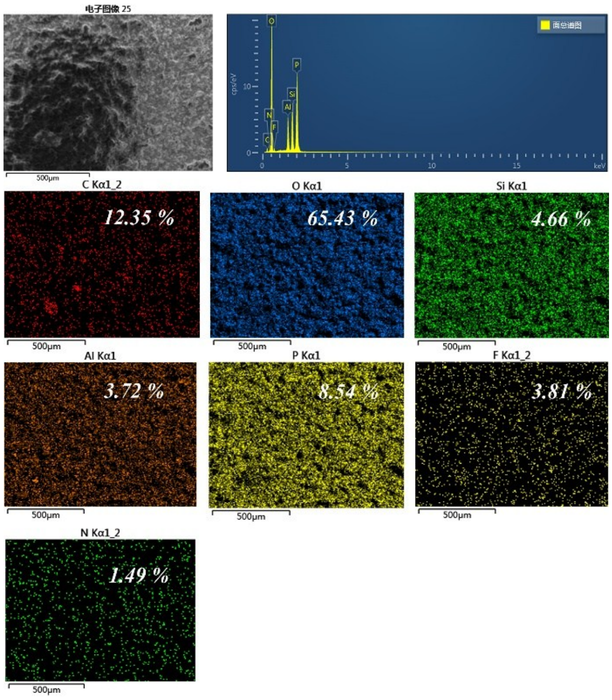

Figure S7. EDS mapping and chemical components of superamphiphobic ceramic.

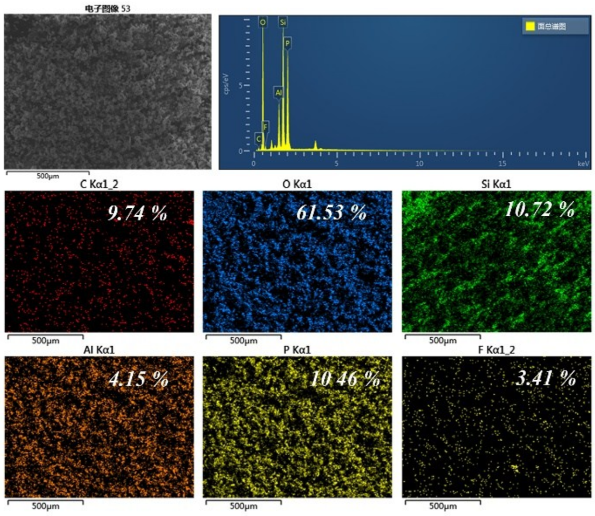

Figure S8. EDS mapping and chemical components of superamphiphobic glass.

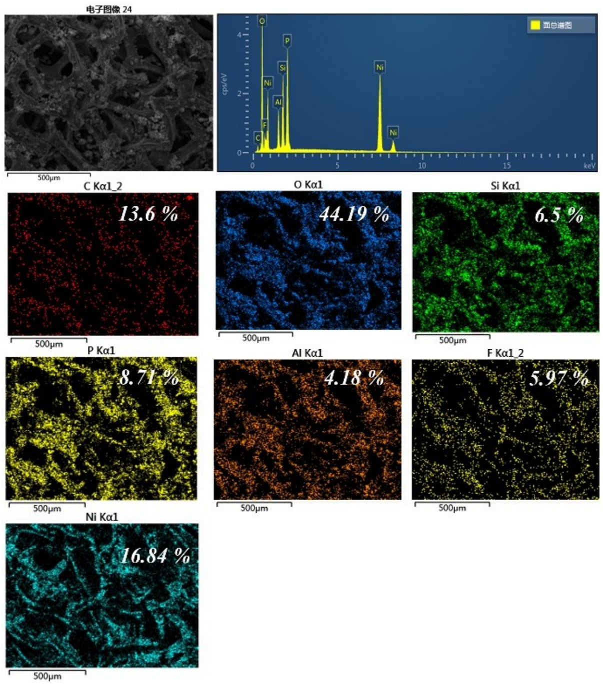

Figure S9. EDS mapping and chemical components of superamphiphobic nickel foam.

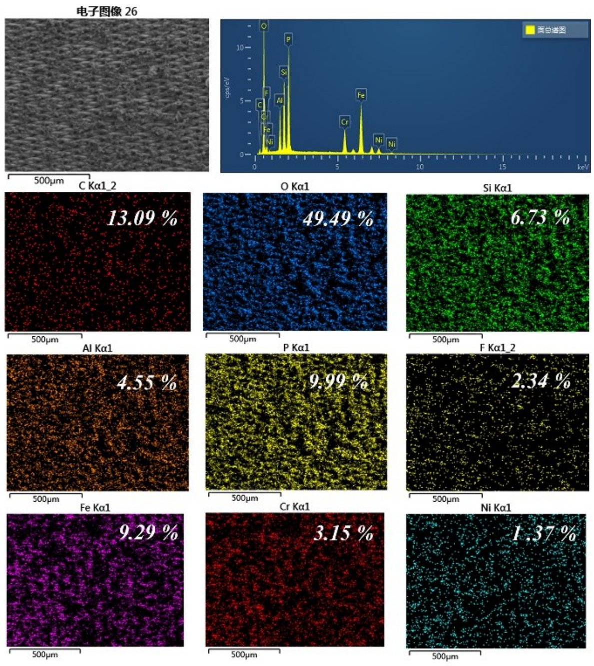

Figure S10. EDS mapping and chemical components of superamphiphobic SSM.

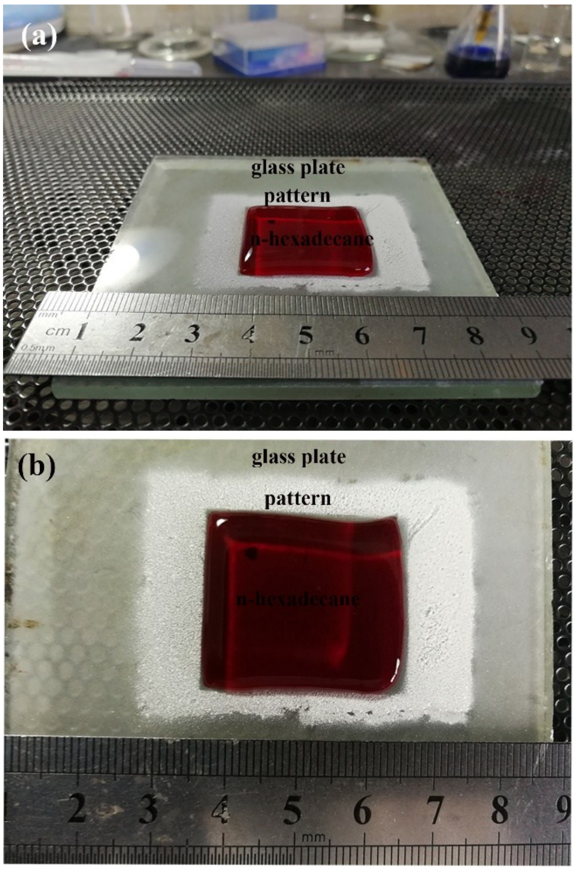

Figure S11. The n-hexadecane liquid was trapped in the superamphiphobic pattern on glass plate.

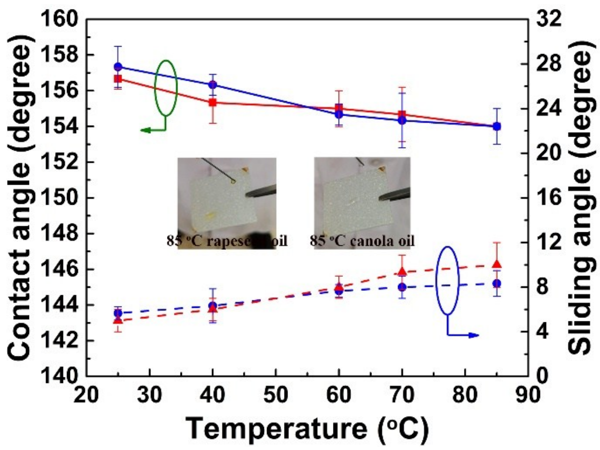

Figure S12. The hot liquid repelling behavior of the coated glass towards rapeseed oil and canola oil with various temperature.

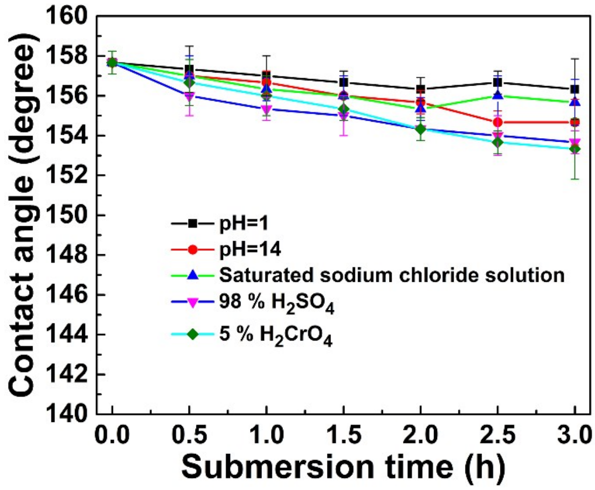

Figure S13. The water contact angle variation of coated glass with submersion time in various corrosive media.

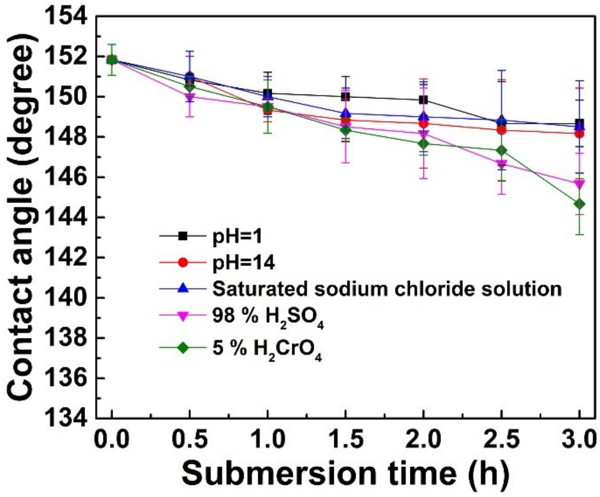

Figure S14. The n-hexadecane contact angle variation of coated glass with submersion time in various corrosive media.

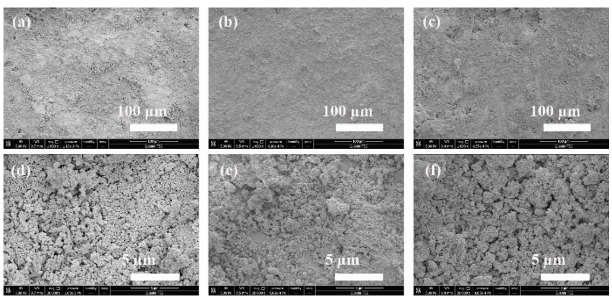

Figure S15. The SEM images of the coated glass after 3h submersion in various corrosive media including pH=1 (a, d), pH =14 (b, e) and saturated sodium chloride solution (c, f).

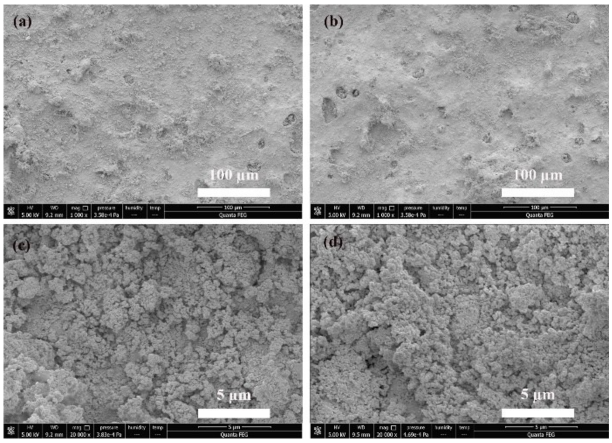

Figure S16. The SEM images of the coated glass after 3h submersion in 98% concentrated sulfuric acid (a, c) and 5 % chromic acid (b, d).

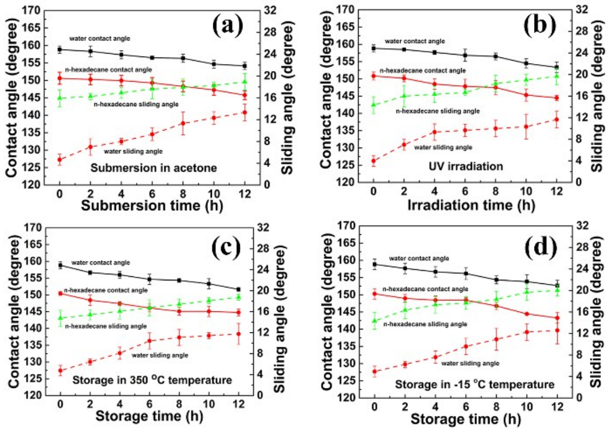

Figure S17. The SCA and SA change of water and n-hexadecane on coated glass with submersion in acetone (a), UV irradiation (b), 350 ºC high temperature storage (c) and -15 ºC low temperature storage (d).

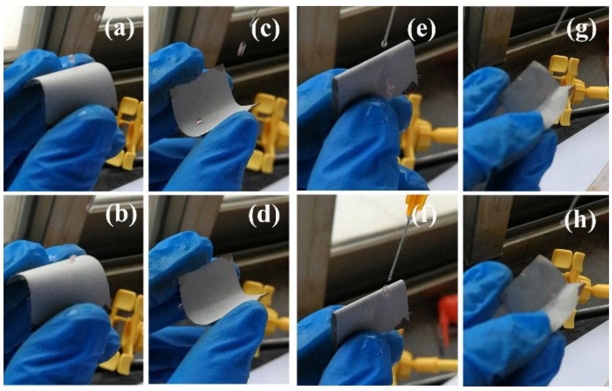

Figure S18. The 1,2-dichloroethane droplet can easily slide off from folding position of coated SSM.

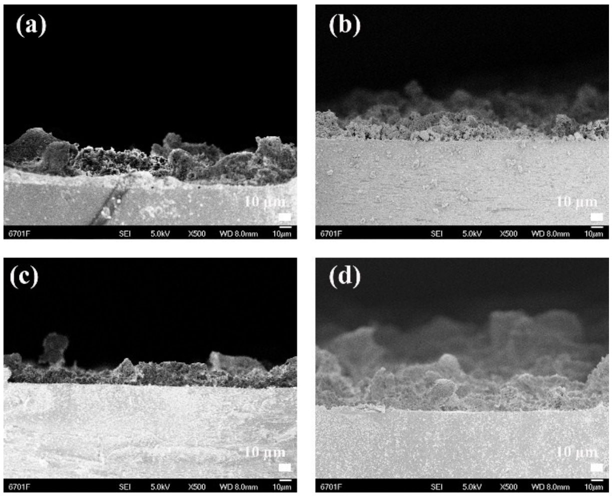

Figure S19. The cross-section view of coated superamphiphobic glass after 50 adhesive-peeling cycles (a), 60 min ultrasonic treatment (b), 50 sandpaper abrasion cycles (c) and 50 sand flow impact cycles (d).

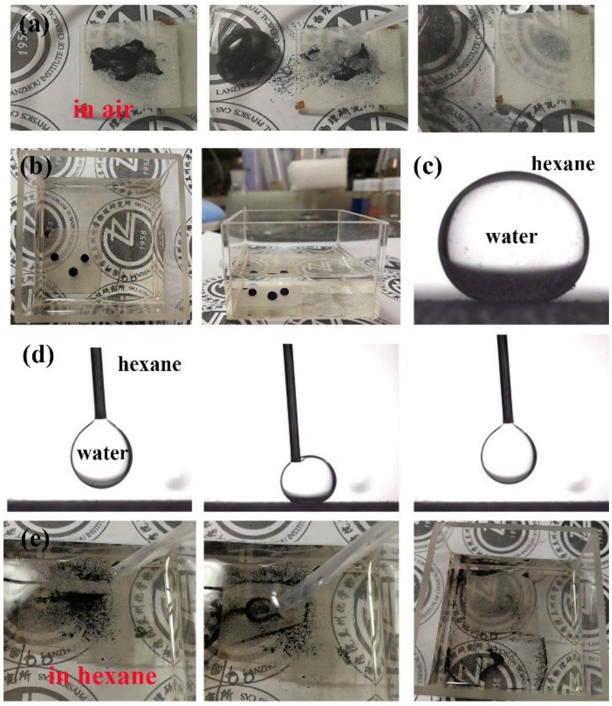

Figure S20. (a) The superamphiphobic coating shows self-cleaning behavior in air. (b) The photographs of water droplets on superamphiphobic coating was immersed into hexane. (c) The under-hexane water SCAs on superamphiphobic coating. (d) The under-hexane dynamic behavior of water on superamphiphobic coating. (e) The coated superamphiphobic glass shows self-cleaning behavior under hexane.

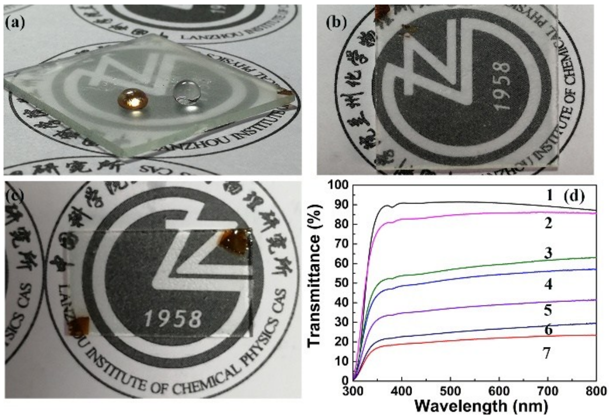

Figure S21. The photographs of superamphiphobic glass in air (a), coated glass wetted by ethanol (b) and coated glass wetted by ethyl oleate (c). (d) Transmittance of original glass (1), semi-transparent coated glass in air (7) and infused with ethyl oleate (2), silicone oil (3), ethanol (4), GPL 103 (5) and GPL 100 (6). The droplets in (a) are diiodomethane and toluene, respectively.

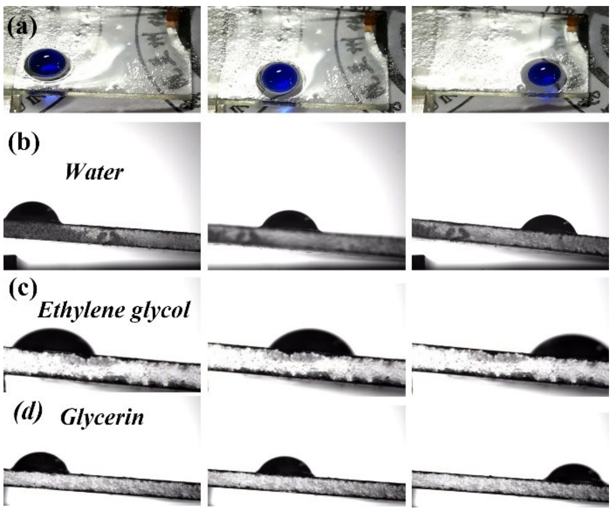

Figure S22. (a) The photographs of a water droplet (dyed with blue) slide on ethyl oleate infused slippery surface. (b-d) Water (b), ethylene glycol (c) and glycerin droplet (d) slide on ethyl oleate infused slippery surface.