Supporting Information

Fabrication of Bacteria and Blood Repellent Superhydrophobic Polyurethane Sponge Material

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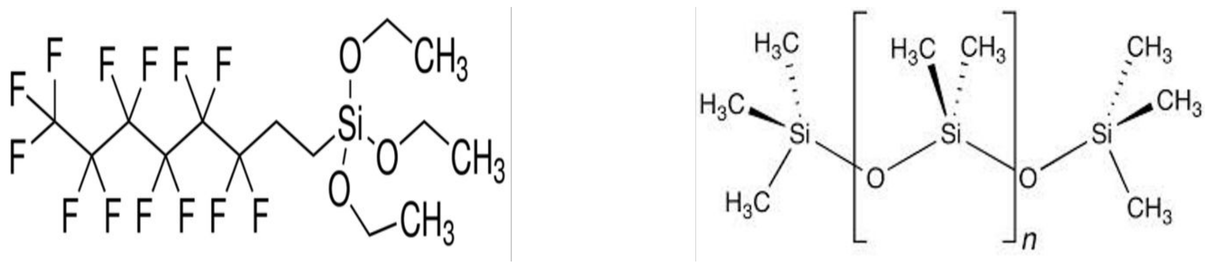

Figure S1. Chemical structures of FAS-17 (on the left) and PDMS (on the right).

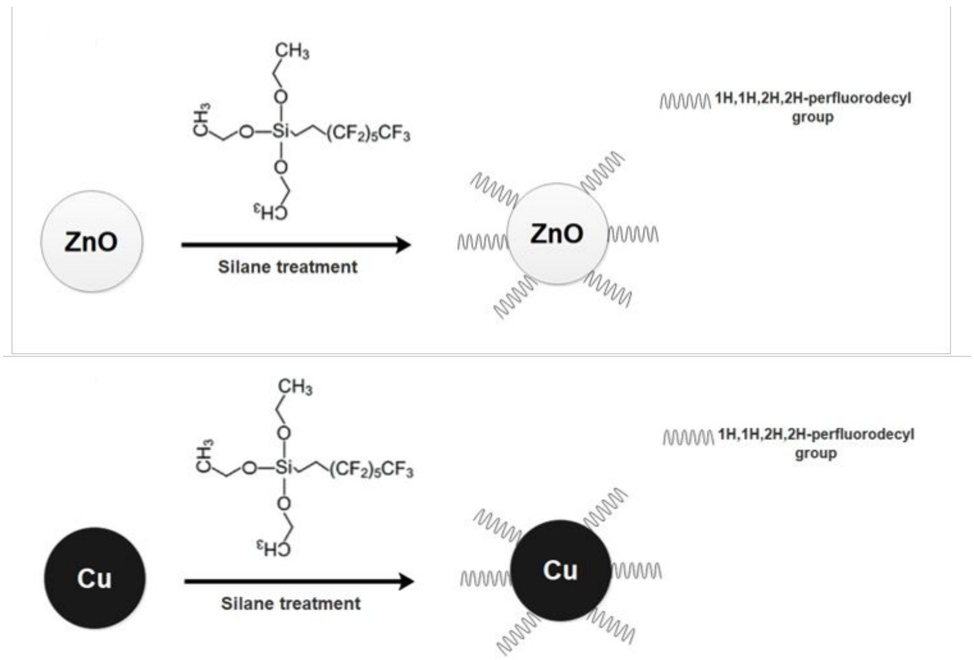

Figure S2. Schematic illustration of the synthesis of FAS-grafted nanoparticles (FAS-ZnO and FAS-Cu NPs).

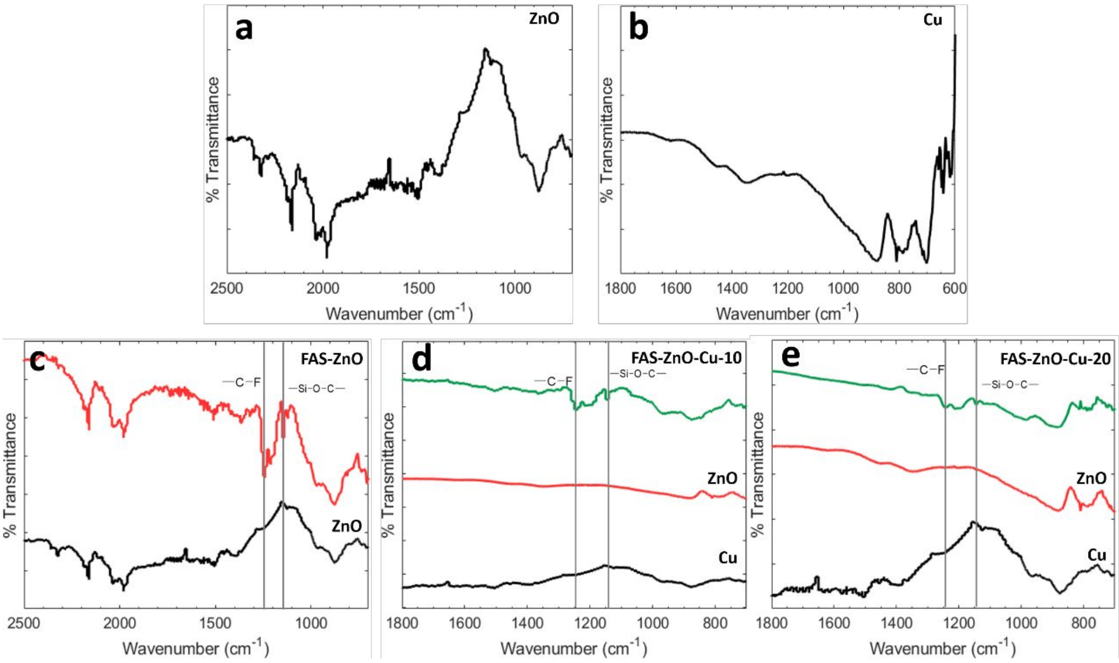

Figure S3. FTIR analysis of (a) ZnO, (b) Cu, (c) FAS-ZnO, (d) FAS-ZnO-Cu-10 and (e) FAS-ZnO-Cu-20 powders.

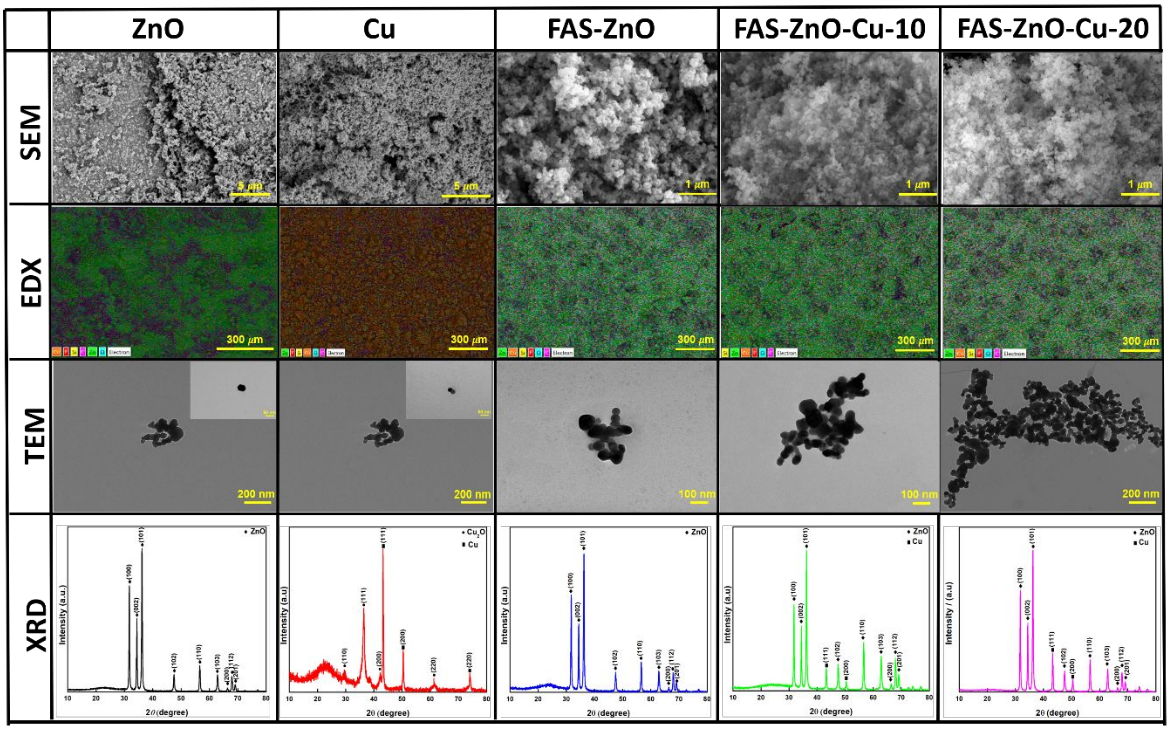

Figure S4. SEM, EDS spectrum, TEM images, and XRD analysis of the untreated and treated powders.

The surface morphology of the as-prepared particles was characterized in detail. From the TEM and SEM images in Figure S4, one can observe that there was no notable difference between the structures and sizes of the particles before and after the flourionization process. In general, the bare ZnO (43 ± 24 nm) and Cu nanoparticles (44 ± 16 nm) (Figure S5) were irregular hexagonal and spherical in shape, respectively and tend to aggregate leading to the formation of larger clusters. For Cu-doped ZnO powders, they exhibit similar irregular morphology in which Cu NPs are distributed within and on the ZnO NP host, forming the hierarchical porous structures with micro/nano-roughness features that is vital in achieving liquid-repellent properties. The EDS mapping images (Figure S4) also show that the main composition of the functionalized particles are zinc, oxygen, and copper from ZnO and Cu NPs, respectively and the distribution of Cu increases with an increased Cu concentration in the paints. Moreover, FAS modification resulted in appearance of the elements F and small amounts of Si, coming from FAS-17. Figure S4 also demonstrates the XRD patterns of the particles, which reveals that all the particles are highly crystalline in nature. Also, the XRD pattern of the bare ZnO and FAS-ZnO NPs match well with that of hexagonal wurtzite ZnO structure, confirming that the FAS-treatment does not change the internal structure of the particles. For the ZnO/Cu samples, the diffraction patterns were similar to those of pure ZnO and Cu NPs, providing further evidence that the composite particles were composed of hexagonal ZnO, cubic Cu and Cu_2O nanocrystals.

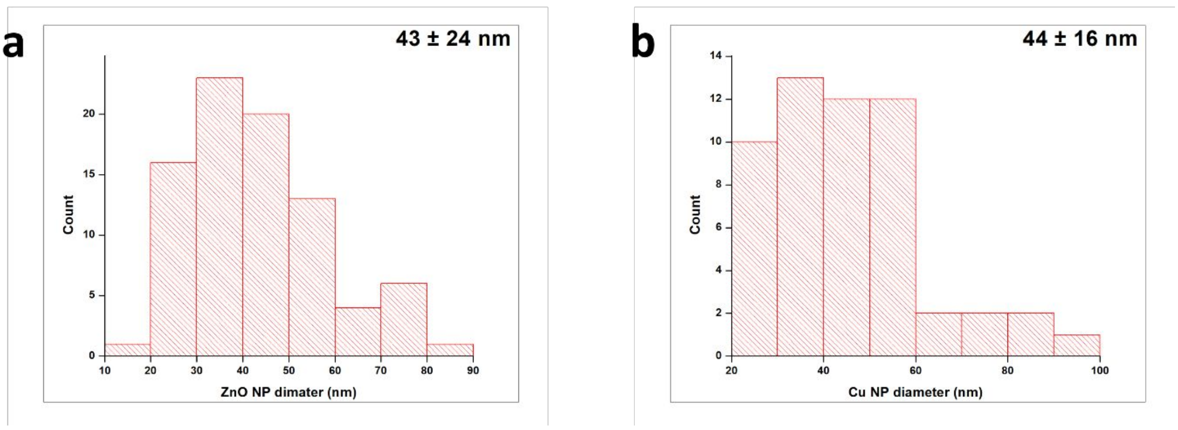

Figure S5. Size distributions of (a) ZnO and (b) Cu NPs.

Figure S6. Large size (27.5 x 14.5 x 2.5 cm) of the sponge painted by superhydrophobic FAS-ZnO-Cu-10 paint.

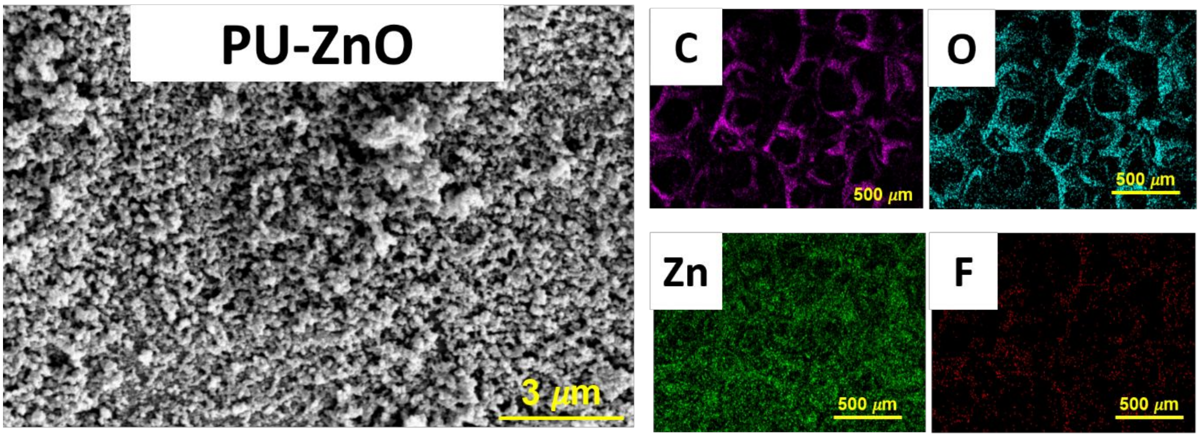

Figure S7. SEM and EDS mapping images of the PU-ZnO sponge.

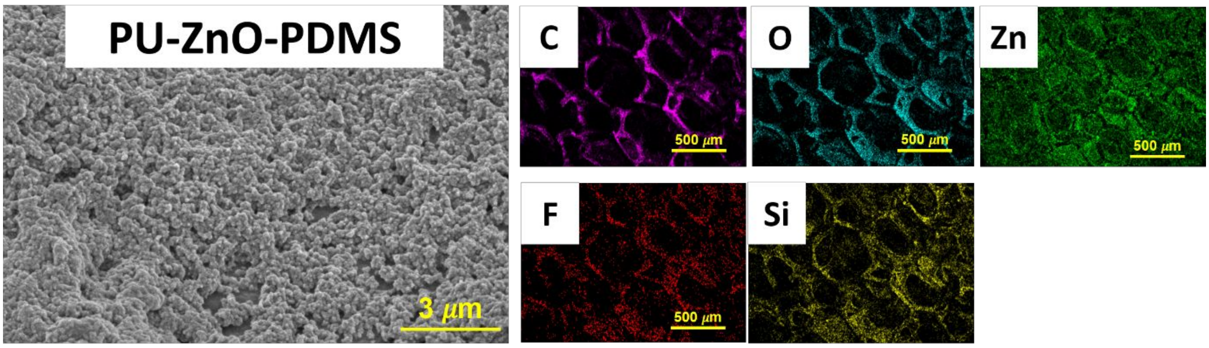

Figure S8. SEM and EDS mapping images of the PU-ZnO-PDMS sponge.

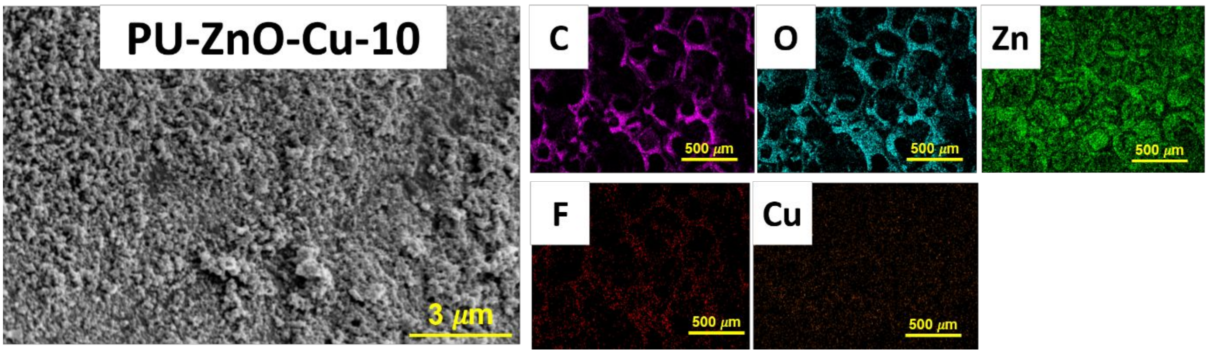

Figure S9. SEM and EDS mapping images of the PU-ZnO-Cu-10 sponge.

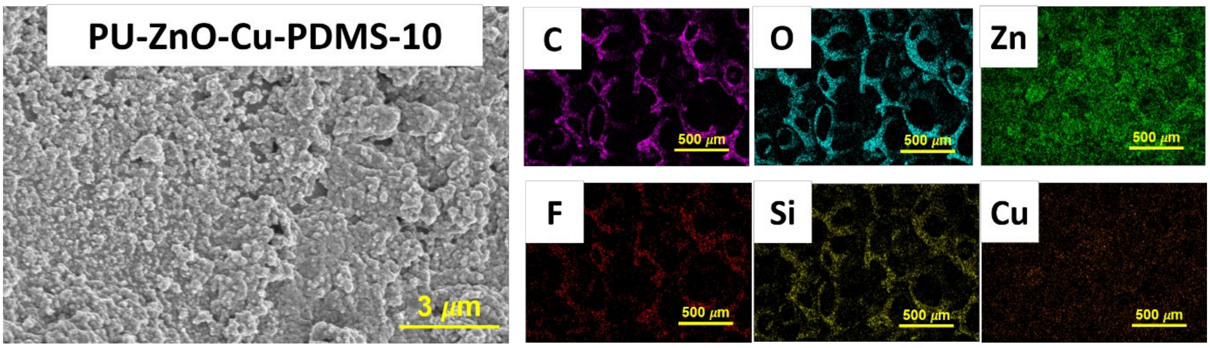

Figure S10. SEM and EDS mapping images of the PU-ZnO-Cu-PDMS-10 sponge.

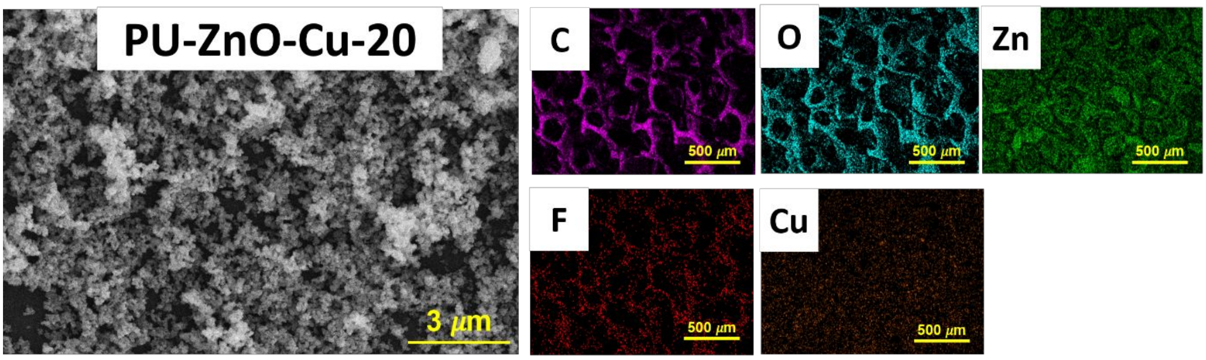

Figure S11. SEM and EDS mapping images of the PU-ZnO-Cu-20 sponge.

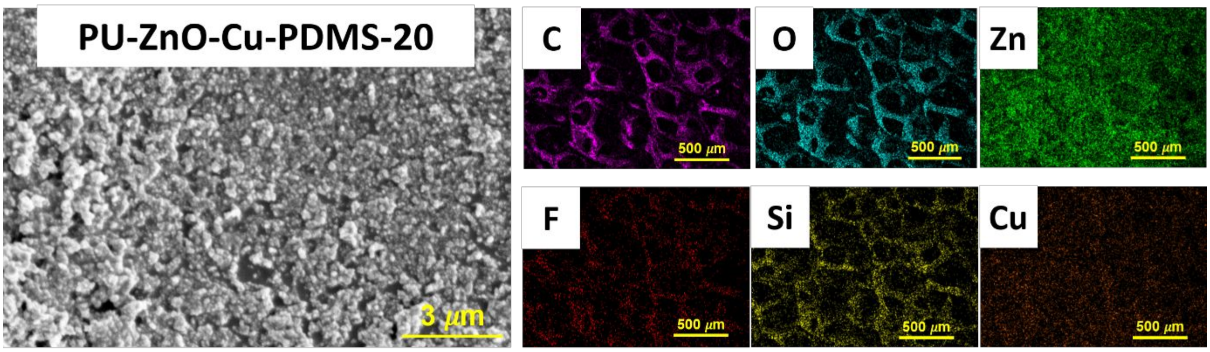

Figure S12. SEM and EDS mapping images of the PU-ZnO-Cu-PDMS-20 sponge.

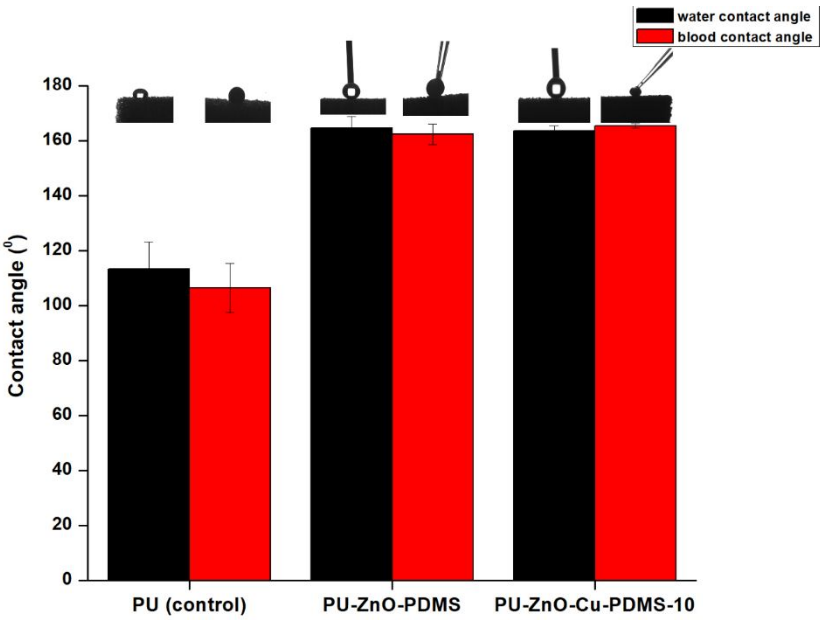

Figure S13. Contact angle of water and blood on various samples. Above: corresponding photographs of each liquid drop on the samples.

Table S1. Advancing Contact angle, Receding Contact angle, and Contact angle Hysteresis for various sponges

sample	advancing contact angle (˚)	receding contact angle (˚)	contact angle hysteresis (˚)
PU	109.6 ± 2.1	69.6 ± 2.5	40.0 ± 2.7
PU-ZNO-PDMS	157.5 ± 2.8	156.4 ± 2.9	1.11 ± 0.9
PU-ZnO-Cu-PDMS-10	157. 7 ± 2.1	156.6 ± 2.1	1.10 ± 0.6
PU-ZnO-Cu-PDMS-20	161.6 ± 1.0	160.8 ± 0.9	0.8 ± 0.2

Video Legends

Video S1. Water repellent test on both the original and hydrophilic sponges

Video S2. Water repellent test on both the bare ZnO and Cu nanoparticles

Video S3. Water repellent test on the FAS-coated nanoparticles

Video S4. Sliding off test on the original and superhydrophobic sponges using various liquid droplets

Video S5. Water, coffee, milk, and juice droplet repellency test on PU-ZnO-PDMS

Video S6. Water, coffee, milk, and juice droplet repellency test on PU-ZnO-Cu-PDMS-10

Video S7. Water, coffee, milk, and juice droplet repellency test on PU-ZnO-Cu-PDMS-20

Video S8. Water, coffee, milk, and juice droplet repellency test on the original sponge

Video S9. The original and superhydrophobic sponges are immersed in water to investigate the presence of a bright plastron layer, characteristic of a superhydrophobic surface.

Video S10. Water bouncing test on the original and superhydrophobic sponges

Video S11. Movement of blood droplets on the inclined surface of the original sponge

Video S12. Sliding off test on the original sponge using blood

Video S13. Sliding off test on PU-ZnO-Cu-PDMS-10 using blood

Video S14. Movement of a blood droplet on the inclined surface of PU-ZnO-Cu-PDMS-10

Video S15. Compressive testing of the composite sponge for 1000 cycles

Video S16. Folding testing of the composite sponge for 50 cycles

Video S17. Different man-made destructions by finger-wipe, single-hand-grasp, and both-hands-kneading on the composite superhydrophobic sponge, and subsequently water droplets were dropped onto the sample after each mechanical test.

Video S18. Knife scratch test

Video S19. Sandpaper abrasion test