Supporting Information

Bioinspired photocatalytic hedgehog coating for super liquid repellency

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The Supplementary Information Includes:

Section S1. Experimental Section

Fabrication of conventional SLIPS. The glass substrates were washed with acetone and ethanol prior to use, and dried under compressed dry air. The hedgehog particles dispersed in ethanol were spin-coated (WS-650-23NPP, Laurell) just after spraying the commercial organic binder (NeverWet®) on to the glass substrates. The spin speed was fixed at 4000 rpm to obtain a uniform coating. This was followed by functionalization of the coated samples using ~100 μL of heptadecafluoro-1,1,2,2-tetrahydrodecyltrichlorosilane (FDTS), and kept for 12 h at reduced pressure and room temperature. This was followed by infusing of the functionalized surfaces with either of Krytox101 and silicone oil (viscosity: 200 cSt) lubricants and utilized as control surfaces for UV illumination tests.

Fabrication of photocatalytic hedgehog SLIPS. The glass substrates were washed with acetone and ethanol prior to use, and dried under compressed dry air. The hedgehog particles dispersed in ethanol were spin-coated (WS-650-23NPP, Laurell) just after spraying the commercial organic binder (NeverWet®) on to the glass substrates. The spin speed was fixed at 4000 rpm to obtain a uniform coating. The hydrophilic coating was then infused with silicone oil (viscosity: 200 cSt) and illuminated with UV light (Uvitron SkyBeam) (wavelength: 365 nm, intensity: 1.5 W/cm^2) simultaneously for 2 minutes. The excess silicone oil was made uniform as the lubricant layer by spinning (1000 rpm, 20 s).

Section S2. Supplementary Figures: Fig. S1-S6

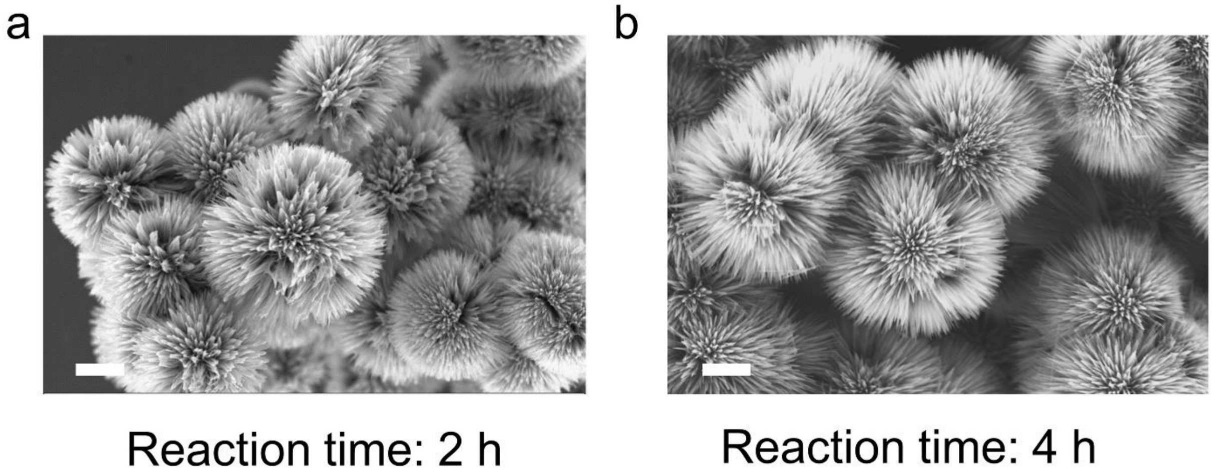

Figure S1. Comparison of the reaction time **a.** 2 h, and **b.** 4 h for the hydrothermal synthesis of hedgehog particles keeping the reaction temperature and precursor ratio of TBT:$TiCl_4$ constant at 180°C and 1:0.65. Scale bar: 1 µm.

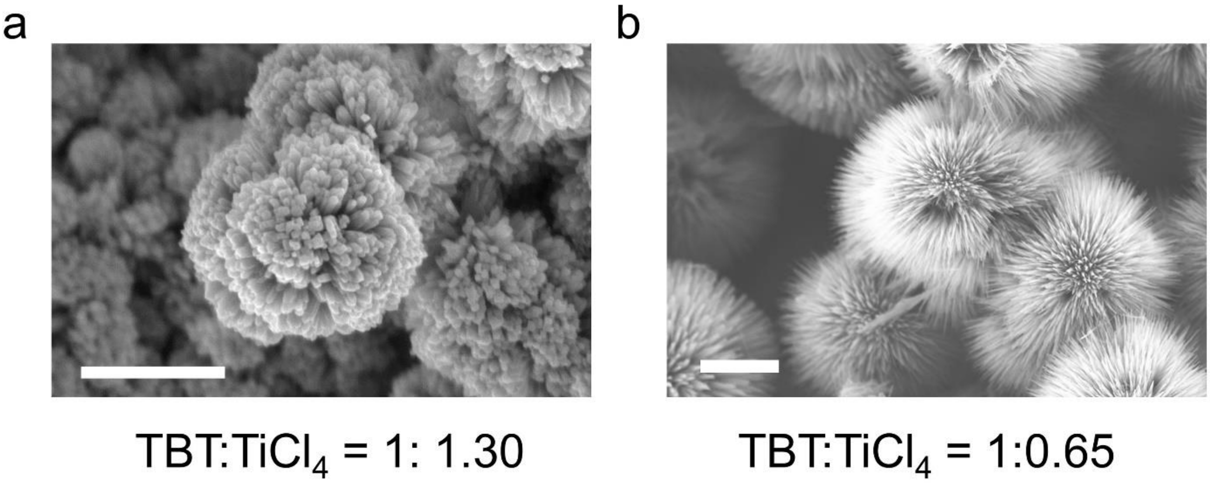

Figure S2. Comparison of the precursor ratio of TBT:$TiCl_4$ to be **a.** 1:1.30, and **b.** 1:0.65 for the hydrothermal synthesis of hedgehog particles keeping the reaction temperature and reaction time constant at 180° C and 4 h respectively. Scale bar: 1 μm.

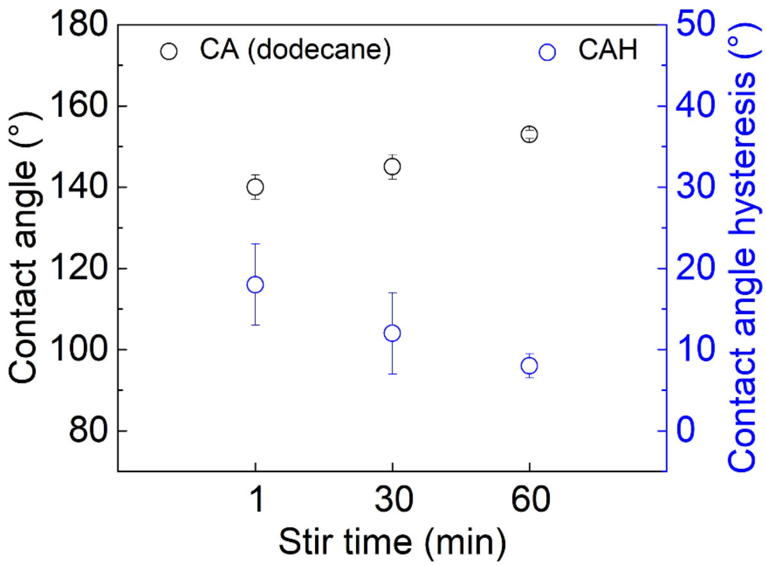

Figure S3. Comparison of wettability of morphologies associated with different stirring time. Contact angle and hysteresis data of dodecane (γ = 25.3 mN m^{-1}) are plotted for morphologies with stirring time of 1 min, 30 min and 60 min prior to baking in oven keeping the reaction temperature, reaction time and precursor ratio of TBT:$TiCl_4$ constant at 180°C, 4 h, and 1:0.65 respectively.

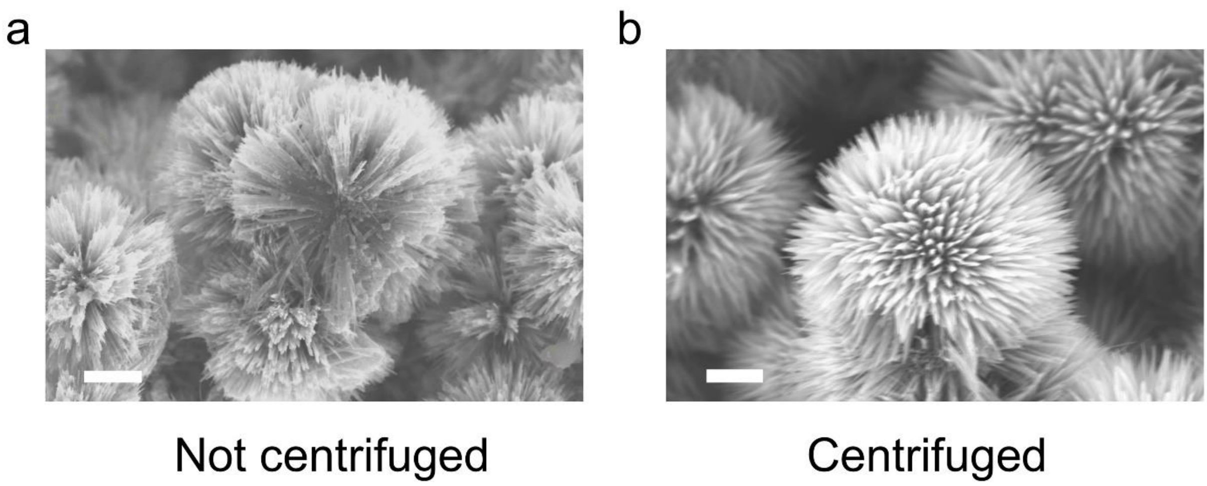

Figure S4. Significance of ethanol wash and centrifugation of the hedgehog particle solution after taking out the autoclave. The sample without centrifuge had nano TiO_2 particles embedded in the gaps between nanoneedles. Scale bar: 1 µm.

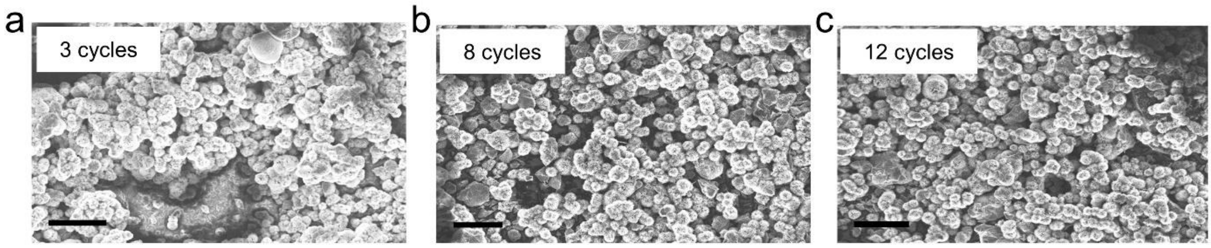

Figure S5. Parametric optimization of the hedgehog coating. **a.-c.** SEM images showing the morphology of the hedgehog coating after spinning of 3, 8, and 12 layers of the hydrophilic hedgehog particles dispersed in ethanol solution on glass substrate. Scale bar: 20 µm.

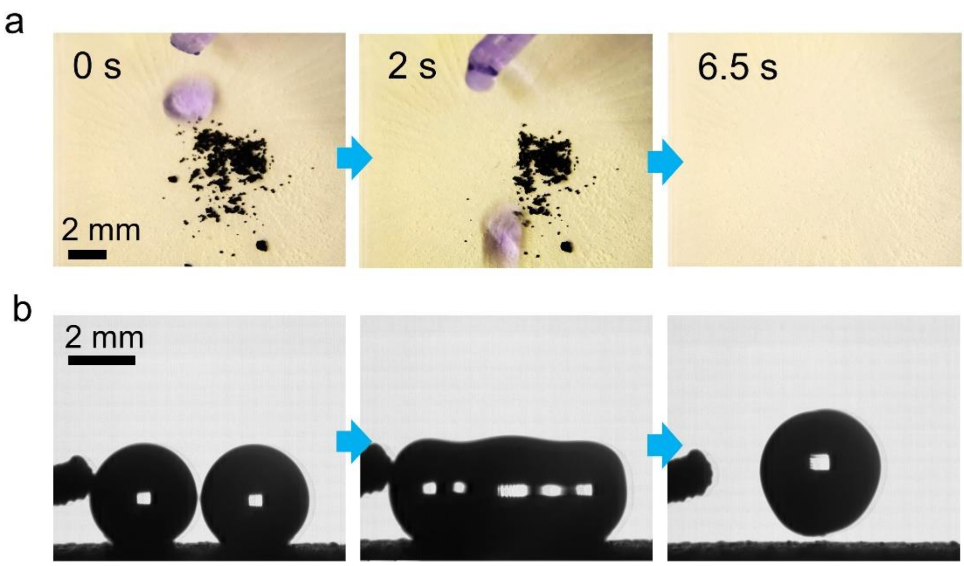

Figure S6. Self-cleaning and jumping of low surface tension droplets. **a.** Pictures showing the self-cleaning property of the superomniphobic hedgehog coating where the dirt particles replicated by iron oxide powder are being washed away from the surface by water droplets dyed blue in color. Volume of droplet used is 20 µL. **b.** High-speed photography images showing coalescence-induced jumping of low surface tension droplets of ethanol-water mixture (γ = 47.6 mN m^{-1}) on the superomniphobic hedgehog coating. Volume of droplet used is 5 µL.