Electronic Supplementary Information

Breath figure lithography for the construction of a hierarchical structure in sponges and their applications in oil/water separation †

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1. Supplementary Figures

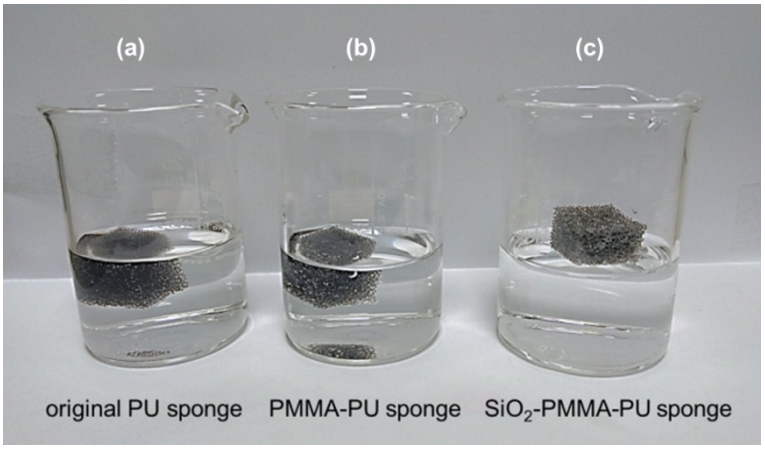

Fig. S1 Photographs of the original PU (a), PMMA-PU (b) and SiO_2-PMMA-PU (c) sponges after being placed in water.

As shown in **Fig. S1a, b**, the sponge structures were easily wetted after being placed in water. Upon the introduction of octadecyl-functionalised SiO_2 nanoparticles, the resultant SiO_2–PMMA–PU sponge showed good water repellency (**Fig. S1c**).

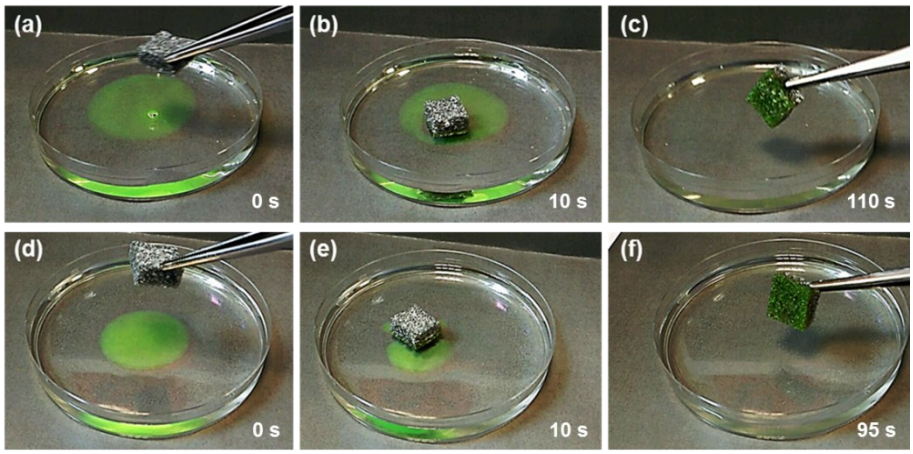

Fig. S2 (a-c) Oil collection behavior of the superhydrophobic SiO_2-PMMA-PU sponge on the surface of an aqueous solution containing 1.0 M HCl; (d-f) Oil collection behavior of the superhydrophobic SiO_2-PMMA-PU sponge on the surface of an aqueous solution containing 1.0 M NaOH.

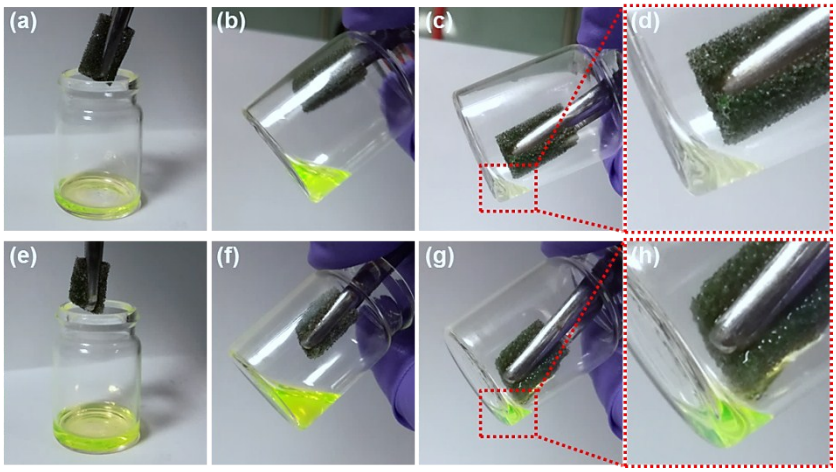

Fig. S3 Collected hexane oils from (a-d)the original PU and (e-h) SiO_2-PMMA-PU sponge.

After collecting oil components on the water surface, the hexane oil was squeezed out from the sponge. **Fig. S3a-d** show the collected components from the original PU sponge. The collecting components would divide into two layers, and leave the colorless water component after the upper oil was removed. The feature indicates that the original sponge will aslo absorb some water componet during the oil-collecting process on the water surface. However, as for the SiO_2-PMMA-PU sponge, only green oil phase were noticed (**Fig. S3e-h**), indicating no water component was absorbed.

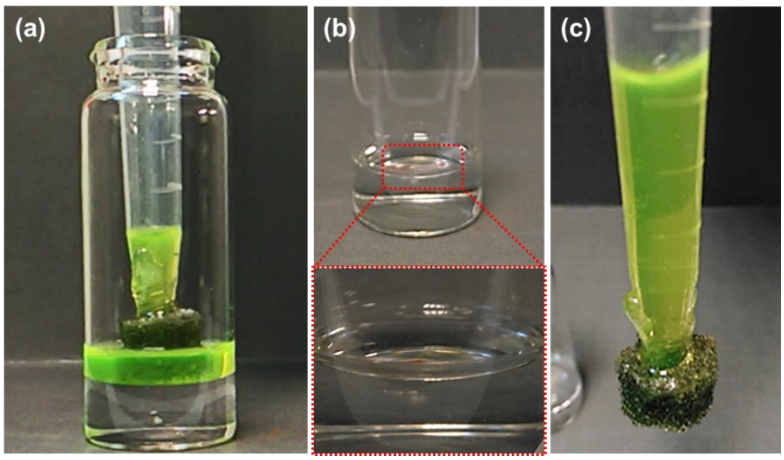

Fig. S4 (a) Optical image of the instrument for the continuous collection of hexane oil (dyed green with BODIPY 505/515) from the water surface with the SiO_2-PMMA-PU sponge. Optical images of (b)the water phase after purified with the SiO_2-PMMA-PU sponge and (c) the collected hexane oil phase.

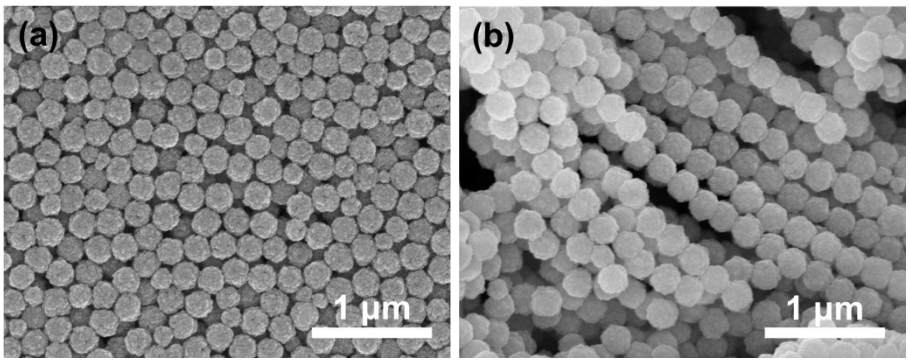

Fig. S5 Scanning electron microscope (SEM) images of (a) Fe_3O_4 nanoparticles and (b) octadecyl-functionalized silica-coated Fe_3O_4 nanoparticles.

As shown in **Fig. S5a**, the Fe_3O_4 nanoparticles had a rough surface, which was attributed to the fact that the magnetic core was a secondary nanostructure composed of dozens of primary iron oxide nanocrystals with smaller sizes. **Fig. S5b** shows the SEM image of the resultant octadecyl-functionalised silica-coated Fe_3O_4 nanoparticles, it reveals that their surfaces became less rough, indicating the successful encapsulation of the bare Fe_3O_4 nanoparticles into silica components.

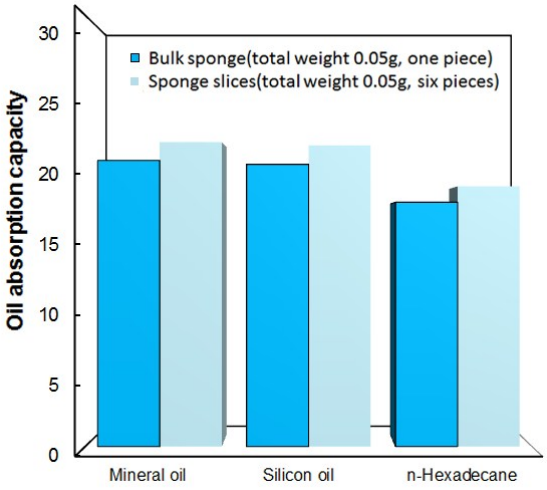

Fig. S6 The oil absorption behavior of the bulk Fe_3O_4–SiO_2-PMMA-PU sponge (total weight, 0.05 g) and corresponding 6 sponge slices (total weight, 0.05 g).

2. Supplementary Videos

Video S1 shows the absorption process of hexane oil (dyed green with BODIPY 505/515) from the water surface illuminated under visiable light.
Video S2 shows the absorption process of hexane oil (dyed green with BODIPY 505/515) from the water surface illuminated under UV light.
Video S3 shows the continuous collection of hexane oil (dyed green with BODIPY 505/515) from the water surface with a pipette.
Video S4 shows the intelligent collection process of organic pollutants driven by magnetic force.