

Supporting Information

Robust hyper-branched polyester-based anti-smudge coatings for self-cleaning, anti-graffiti and chemical shielding

*Ximing Zhong,^a Hengfeng Hu,^a Lei Yang,^b Jie Sheng,^c Heqing Fu^{*a}*

(a School of Chemistry and Chemical Engineering, Guangdong Provincial Key Lab of Green Chemical Product Technology, South China University of Technology, Guangzhou 510640, P.R. China; b College of Chemistry and Environmental Engineering, Shaoguan University, Shaoguan 512005, P.R. China; c School of Chemistry and Chemical Engineering, Guangzhou University, Guangzhou 510006, P.R. China)

*Corresponding author. Tel: +86 020 87114919; Email: fuhq@scut.edu.cn.

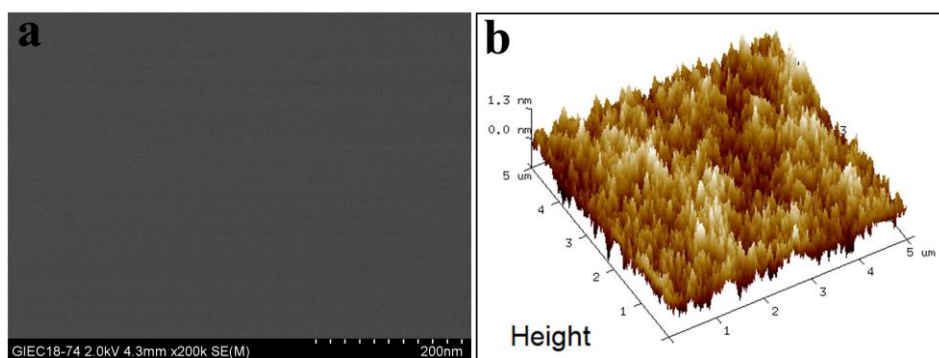


Figure S1. (a) SEM image of the coating surface. (b) AFM 3D topography image of the coating surface. The root-mean-square roughness of the coating surface was 0.36 nm.

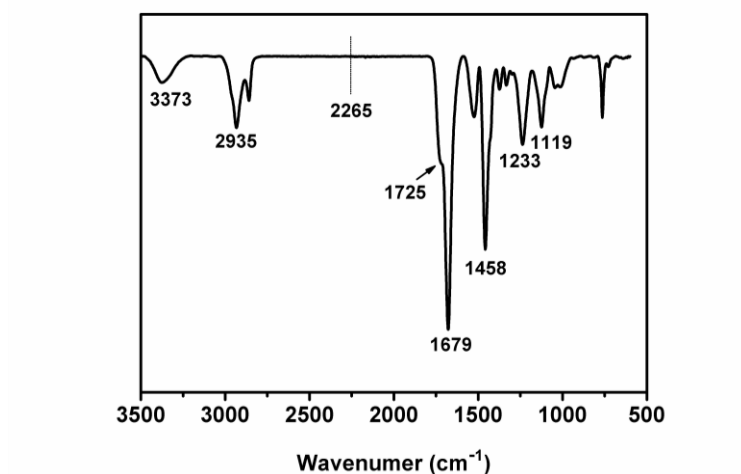


Figure S2. FT-IR spectrum of the anti-smudge coating. The peak at 2265 cm^{-1} corresponding to isocyanate groups was undetectable, indicating the complete consumption of isocyanate groups after thermal curing, and the resultant carbamate groups were confirmed by the peaks at 3373 cm^{-1} and 1679 cm^{-1} . Besides, the peaks at 2935 cm^{-1} , 2860 cm^{-1} , and 1458 cm^{-1} represented $-\text{CH}_2-$ asymmetric stretching vibration, symmetric stretching vibration and bending vibration, respectively. The peaks corresponding to Si-O-Si and Si-CH₃ were overlapped by the peaks at 1119 cm^{-1} and 1233 cm^{-1} that represented the stretching vibration of C-O-C at ester groups. And the peak at 1725 cm^{-1} corresponded to the characteristic absorption of $-\text{C}=\text{O}$.

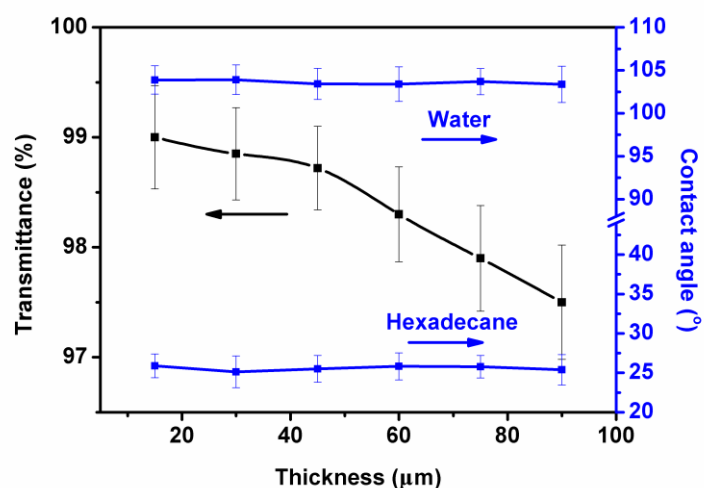


Figure S3. Variations of optical transmittance as well as contact angles toward water and hexadecane as a function of coating thickness.

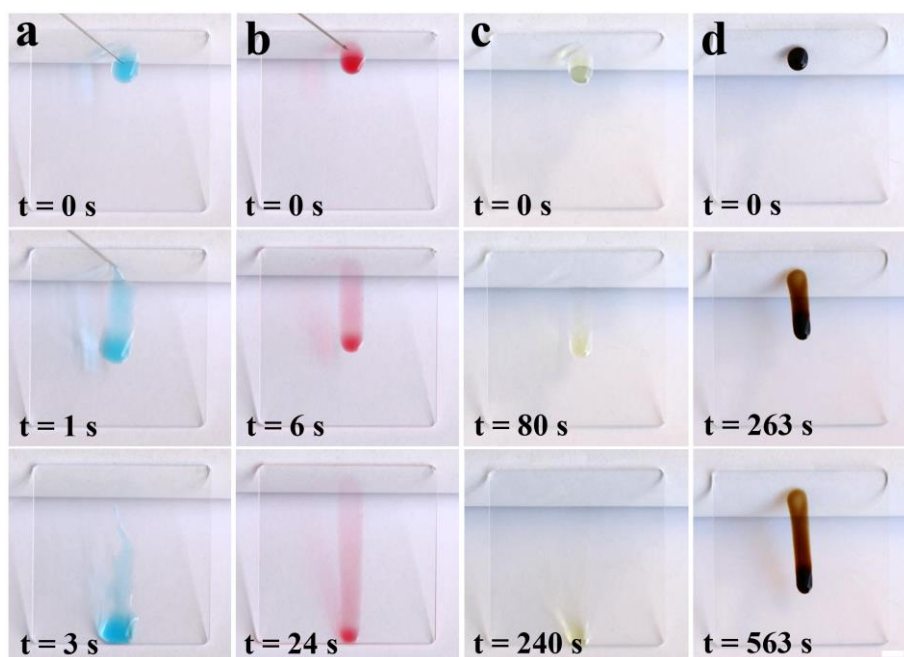


Figure S4. Photographs of various liquids on uncoated glass plates. (a) Blue-dyed water droplet. (b) Red-dyed hexadecane droplet (c) Pump oil droplet. (d) Crude oil droplet. Water droplet applied was 40.0 μL , and the tilting angle of the coated glass plate was about 25.0 $^\circ$. (scale bar, 5 mm)

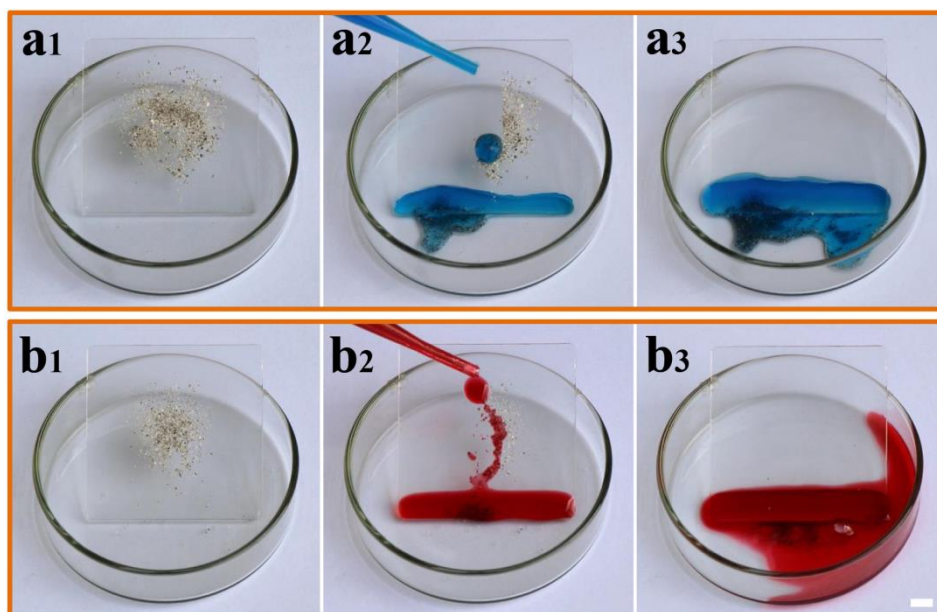


Figure S5. Photographs of the removal of dust scattered on coating surface. (a) Dust removed by dropping water droplets. (b) Dust cleaned away by dropping hexadecane droplets. (scale bar, 5 mm)

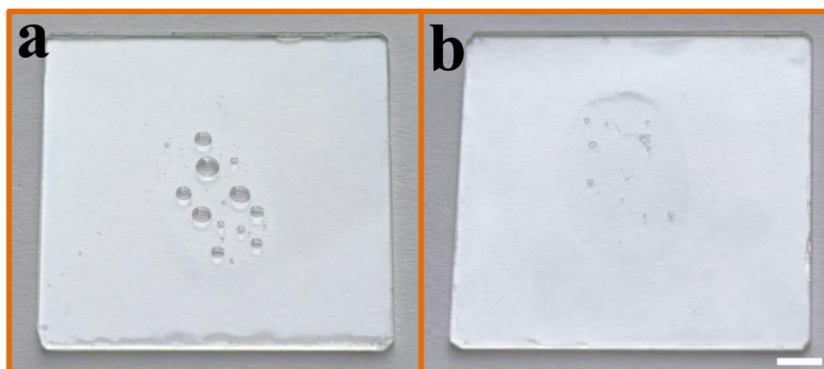


Figure S6. Anti-fingerprint test. (a) Artificial fingerprint liquid pressed by finger contracted on the coated glass plate. (b) Artificial fingerprint liquid pressed by finger wetted and showed no contraction on the uncoated glass plate. (scale bar, 5 mm)

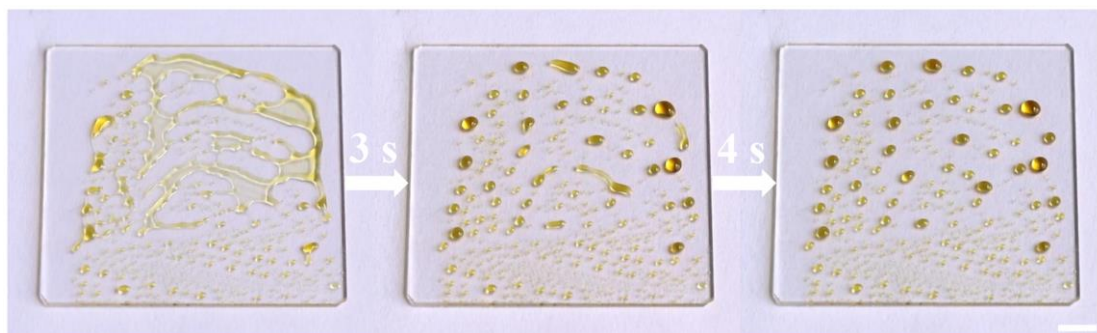


Figure S7. Contraction of the diluted oil-based paint on coated glass plate. The pristine paint was diluted with propylene glycol methyl ether acetate to 80 wt% solid content. (scale bar, 5 mm)

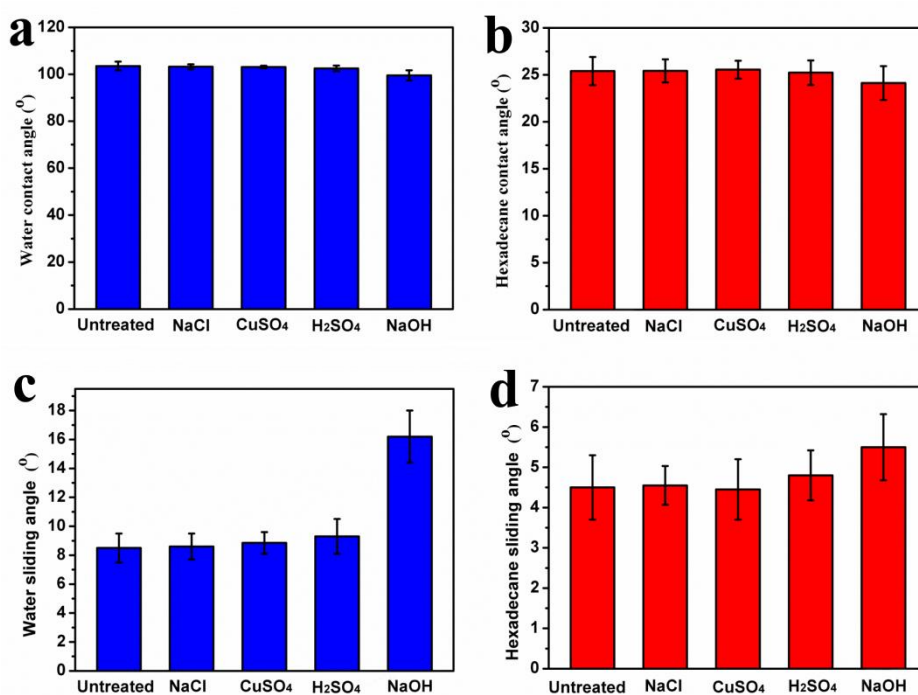


Figure S8. Variations of (a) water contact angle, (b) hexadecane contact angle, (c) water sliding angle, and (d) hexadecane sliding angle on coating surface after the coatings were immersed in 5.0 wt% NaCl solution, 0.5 M CuSO₄ solution, H₂SO₄ solution (pH = 0), and NaOH solution (pH = 14) for 15 h respectively. Water volume for sliding angle measurement was 40.0 μ L, and hexadecane applied was 5.0 μ L.

Table S1. Atom percentages of the coating surfaces before and after abrasion test

Atom	Atom %	Atom %
	Before Abrasion	After Abrasion
Si	17.82	10.97
C	55.69	60.13
N	4.05	6.98
O	22.44	21.92



Figure S9. Ink contraction on the coating after subjected to 5000 abrasion cycles.

And the background for taking photograph was a white paper. (scale bar, 1 mm)

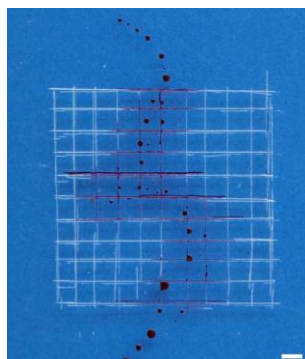


Figure S10. Ink contraction on the coated glass plate after subjected to adhesion test.

And the background for taking photograph was a blue paper. (scale bar, 1 mm)