

Supporting Information

Rewritable large-area structural color films based on Mie scattering of Cu₂O@SiO₂ microspheres

Wenbo Wu^a, Tianyi Liu^a, Yaqun Han^a, Yue Wu^{*a} and Suli Wu^{*a}

State Key Laboratory of Fine Chemicals, Frontier Science Center for Smart
Materials, School of Chemical Engineering, Dalian University of Technology,
Dalian 116024, China

* Corresponding Author Email: wusuli@dlut.edu.cn. (S. W.)

yuewu@nimte.ac.cn (Y.W.)

Other Author E-mail: wwb202212@163.com (W.B.)

Liutianyi@mail.dlut.edu.cn (T.L.)

hanyaqun2019@163.com (Y.H.)

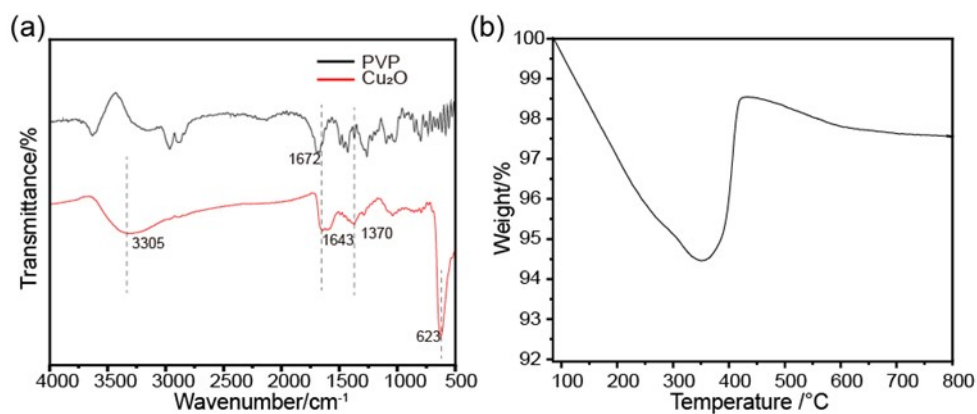


Fig. S1 (a) FT-IR spectra of Cu_2O microspheres and PVP.(b) Thermal gravimetric curve of Cu_2O microspheres

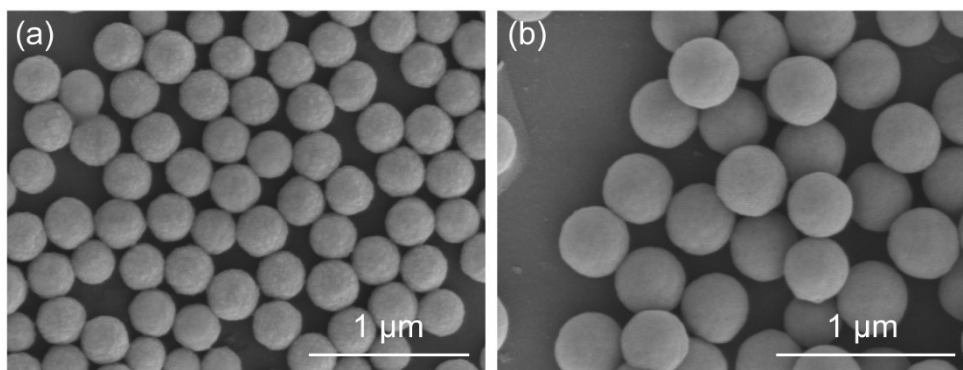


Fig.S2 (a) Cu_2O microspheres with a diameter of 290 nm. (b) $\text{Cu}_2\text{O}@Si\text{O}_2$ core-shell microspheres with a diameter of 398 nm

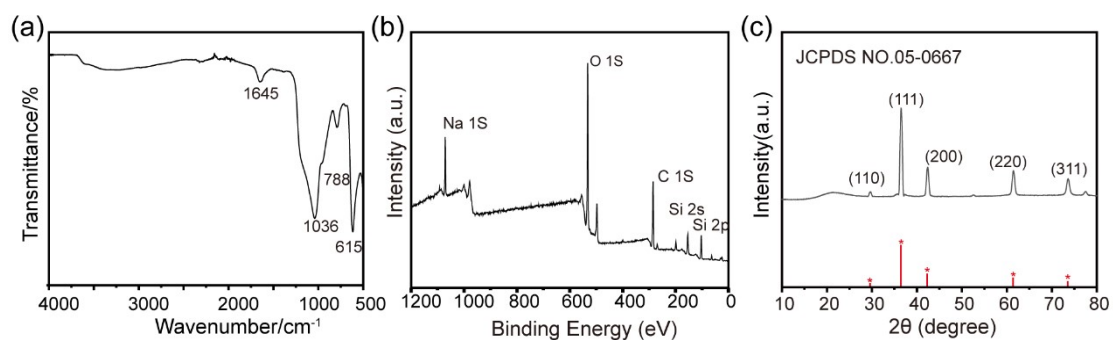


Fig.S3 (a) FT-IR spectra, (b) XPS survey spectra, and (c) XRD patterns of $\text{Cu}_2\text{O}@Si\text{O}_2$ core-shell microspheres

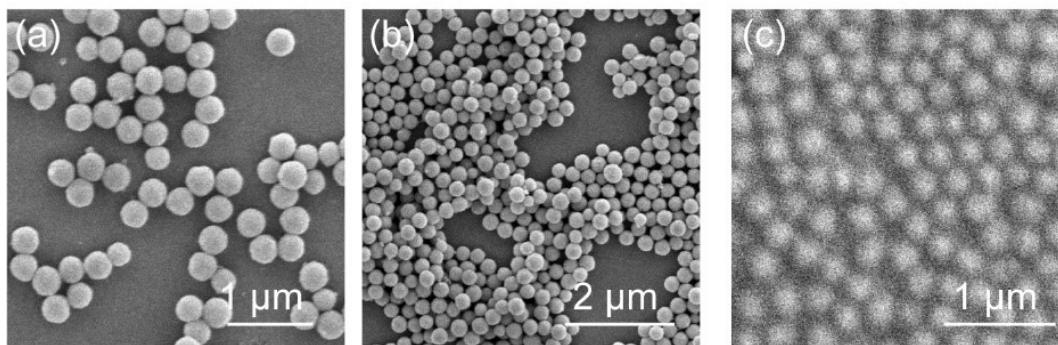


Fig.S4 (a) SEM image of the 261 nm Cu₂O@SiO₂ microspheres. (b) SEM image of the disordered structure prepared from the 261 nm Cu₂O@SiO₂ microspheres. (c) SEM images of the Cu₂O@SiO₂/PDMS film

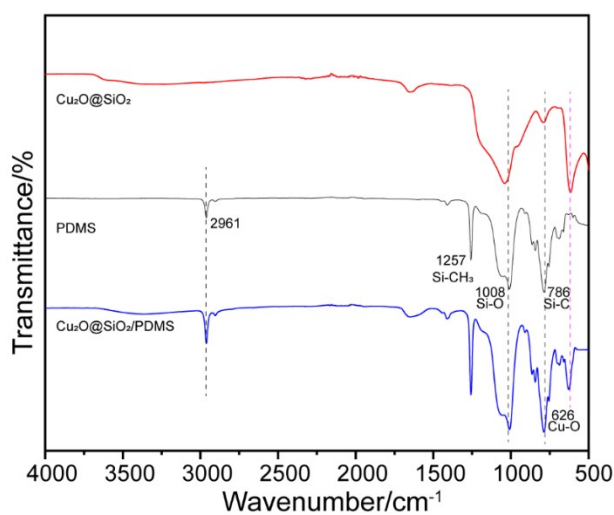


Figure.S5 The FT-IR spectra of Cu₂O@SiO₂, PDMS, and Cu₂O@SiO₂/PDMS.

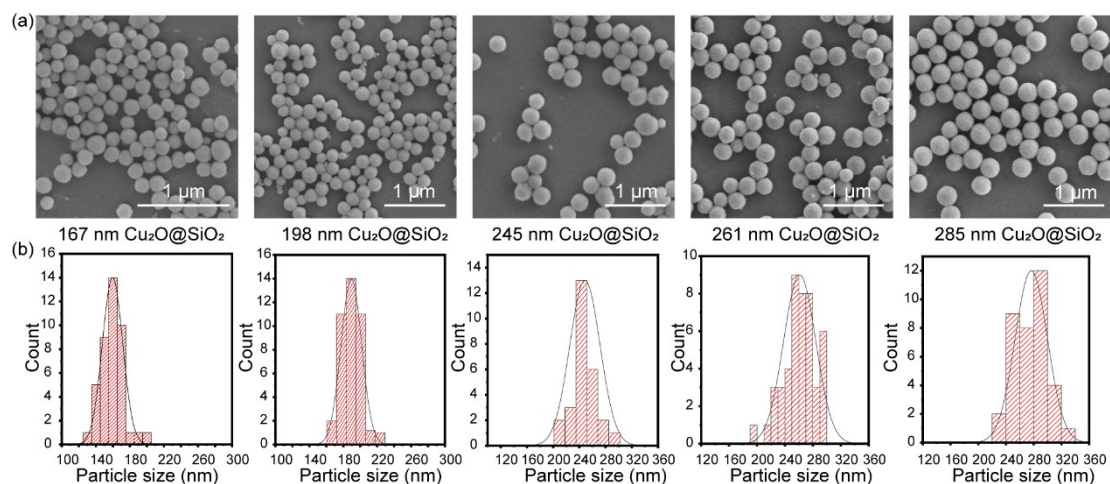


Fig.S6 SEM images (a) and corresponding particle size distribution diagrams (b) of $\text{Cu}_2\text{O}@/\text{SiO}_2$ nanoparticles with different particle sizes; from left to right: 167 nm, 198 nm, 245 nm, 261 nm, and 285 nm.

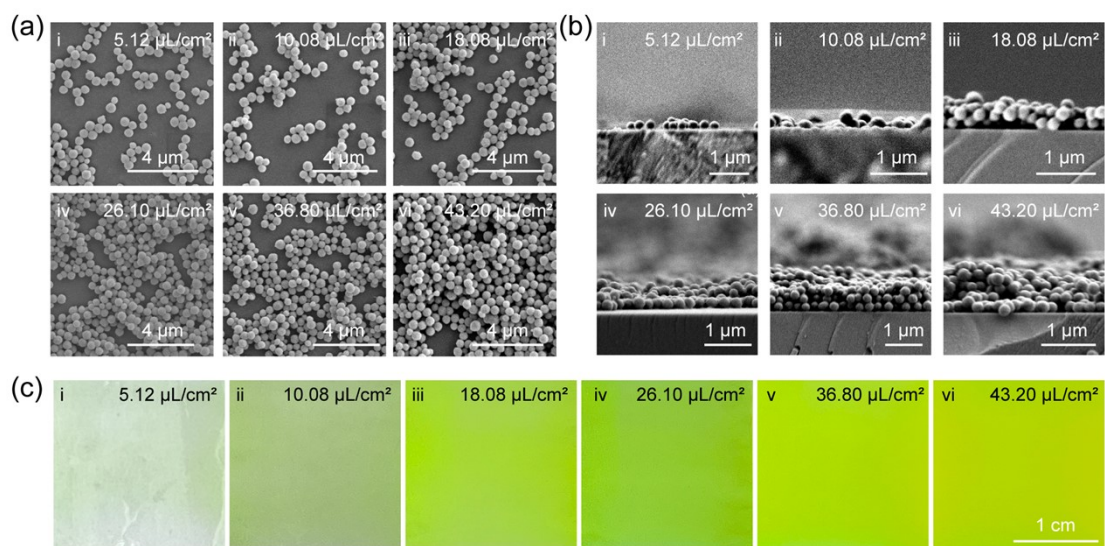


Fig.S7 lan-view (a) and cross-sectional (b) SEM images and corresponding digital photographs (c) of $\text{Cu}_2\text{O}@/\text{SiO}_2$ disordered structures prepared with different spraying amounts: (i) 5.12 $\mu\text{L}/\text{cm}^2$; (ii) 10.08 $\mu\text{L}/\text{cm}^2$; (iii) 18.08 $\mu\text{L}/\text{cm}^2$; (iv) 26.10 $\mu\text{L}/\text{cm}^2$; (v) 36.80 $\mu\text{L}/\text{cm}^2$; (vi) 43.20 $\mu\text{L}/\text{cm}^2$.

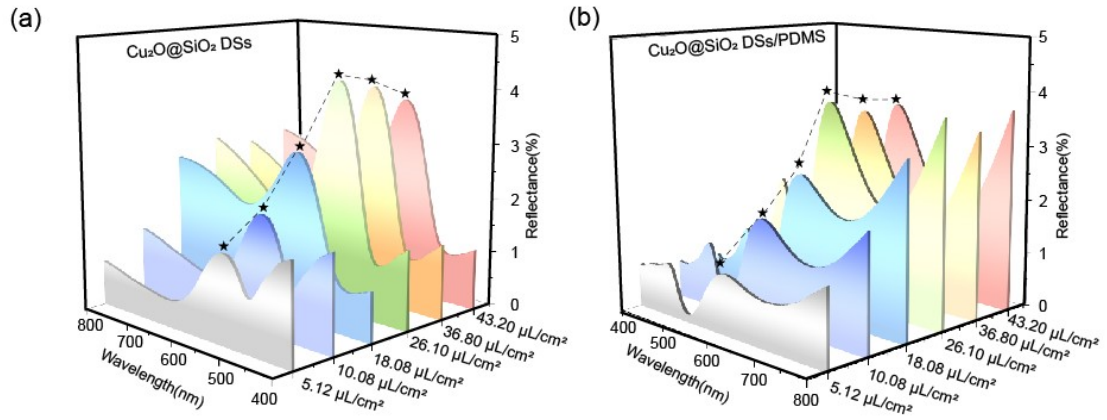


Fig.S8 (a) Reflection spectra of disordered $\text{Cu}_2\text{O}@/\text{SiO}_2$ structures with different spray amounts; (b) Reflection spectra of the corresponding $\text{Cu}_2\text{O}@/\text{SiO}_2/\text{PDMS}$ films

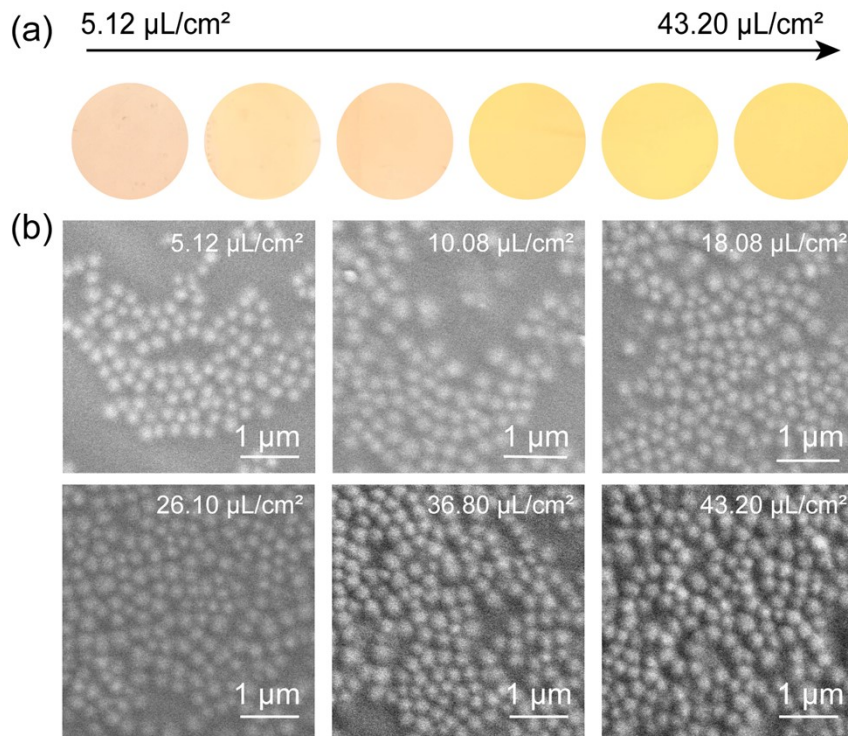


Fig.S9 (a) Structural colors and (b) corresponding SEM images of $\text{Cu}_2\text{O}@/\text{SiO}_2/\text{PDMS}$ films prepared with different spraying amounts.

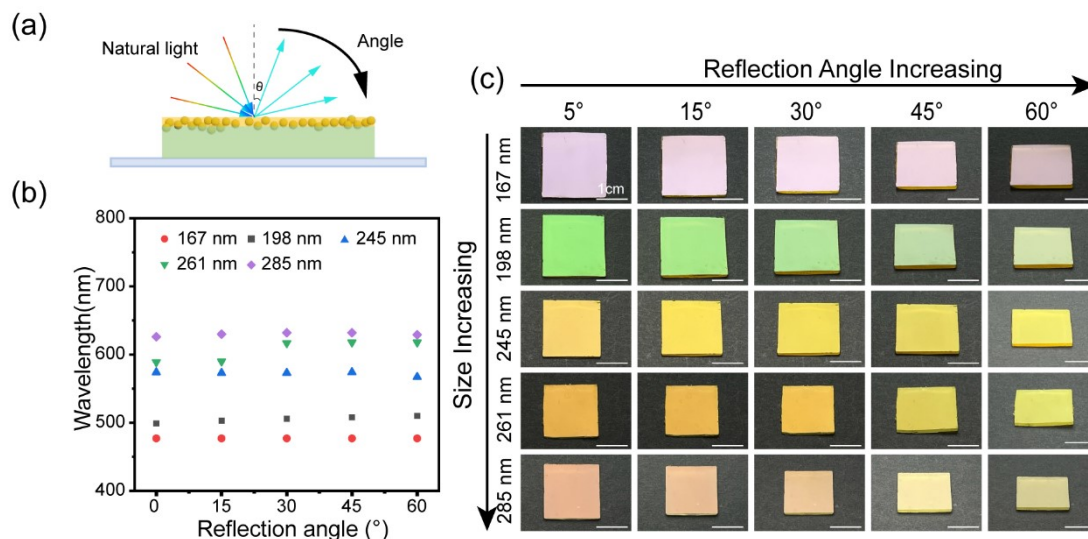


Fig.S10 (a) Schematic diagram of the experimental setup for capturing angle-dependent structural colors, (b) Ternary relationship among reflection wavelength, particle size, and reflection angle, (c) Digital photographs of the colored films assembled from $\text{Cu}_2\text{O}@\text{SiO}_2$ particles of different sizes, viewed from various reflection angles. The scale bar in all digital photographs is 1 cm.

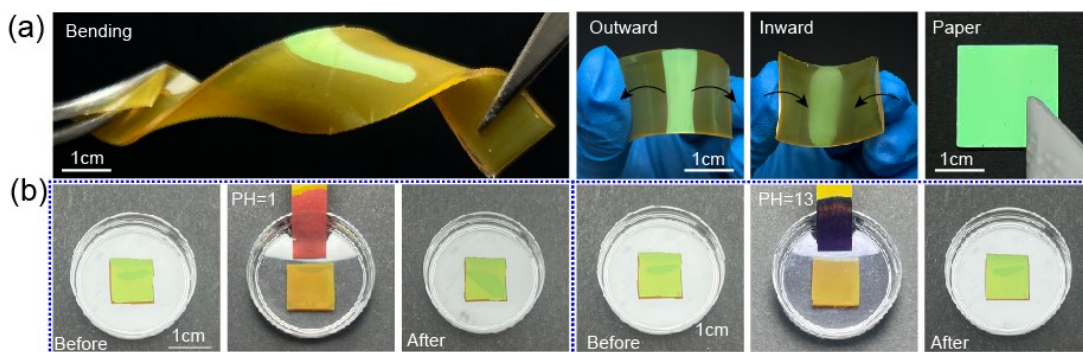


Fig.S11 (a) Digital photographs of the $\text{Cu}_2\text{O}@\text{SiO}_2/\text{PDMS}$ film during bending, folding, wiping, and acid/alkali resistance tests (b)

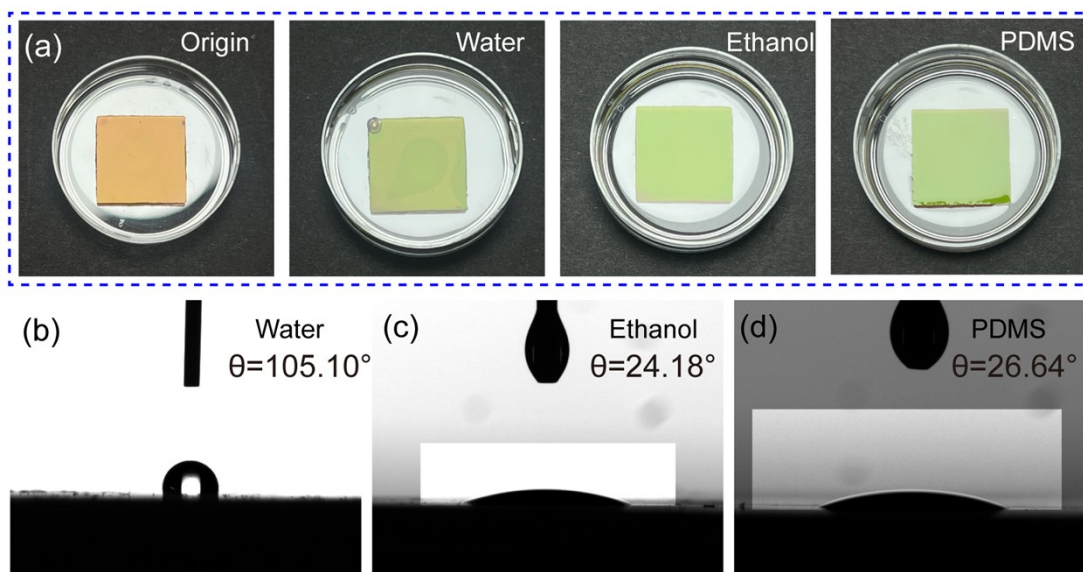


Fig.S12 Universality of the covering liquid: (a) Digital photographs of writing on $\text{Cu}_2\text{O}@/\text{SiO}_2/\text{PDMS}$ films using water, ethanol, and silicone oil; (b) Contact angle of water; (c) Contact angle of ethanol; (d) Contact angle of silicone oil.

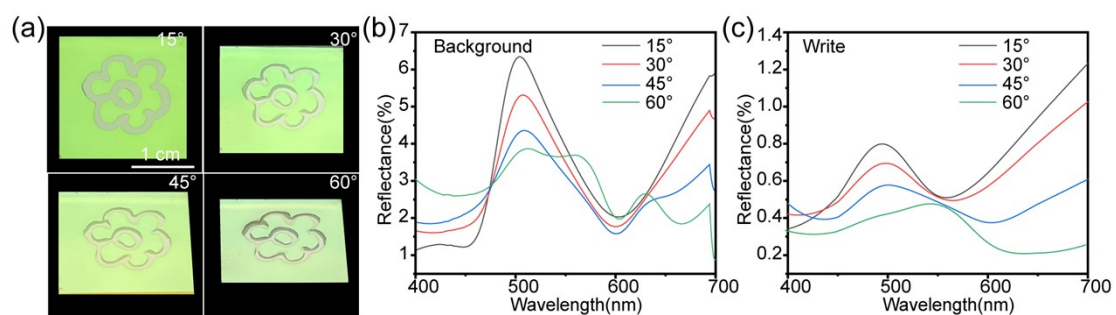


Fig.S13 Angle-dependent properties of the written patterns on the $\text{Cu}_2\text{O}@/\text{SiO}_2/\text{PDMS}$ film: (a) Digital photographs of the written marks captured at different viewing angles; (b) Reflectance spectra of the background and (c) the written pattern observed at various angles.

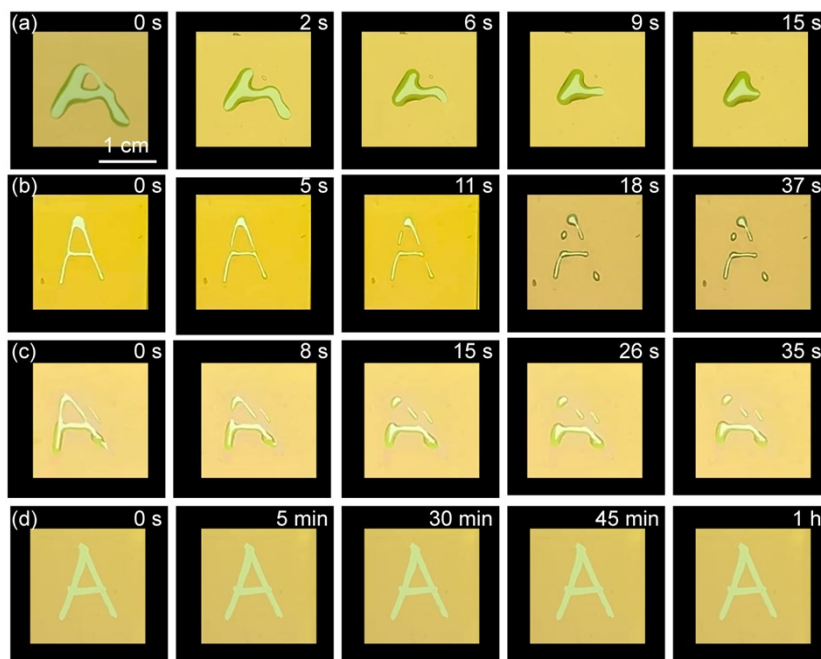


Fig.S14 Residence time of different liquids written on the $\text{Cu}_2\text{O}@\text{SiO}_2/\text{PDMS}$ film: (a) ethanol; (b) peanut oil; (c) mineral oil; (d) silicone oil