Electronic Supplementary Information

Remote-Controllable and Encryptable Smart Glass: Photoresponsive Azobenzene Molecular Commander Determines the Molecular Alignments of Liquid Crystal Soldiers

Minwoo Rim,[a] Dong-Gue Kang,[a] Dayoung Jung,[a] Seok-In Lim,[a] Kyung Min Lee,[b] Nicholas P. Godman,[b] Michael E. McConney,[b] Luciano De Sio,[c] Suk-kyun Ahn*[d] and Kwang-Un Jeong*[a]

a. Department of Polymer-Nano Science and Technology, Department of Nano Convergence Engineering, Jeonbuk National University, Jeonju 54896, Republic of Korea. E-mail: kujeong@jbnu.ac.kr
b. US Air Force Research Laboratory, Wright-Patterson Air Force Base, Ohio 45433, USA.
c. Department of Medico-Surgical Science and Biotechnologies, Center for Biophotonics, Sapienza University of Rome, Latina 04100, Italy.
d. Department of Polymer Science and Engineering, Pusan National University, Busan 46241, Republic of Korea.

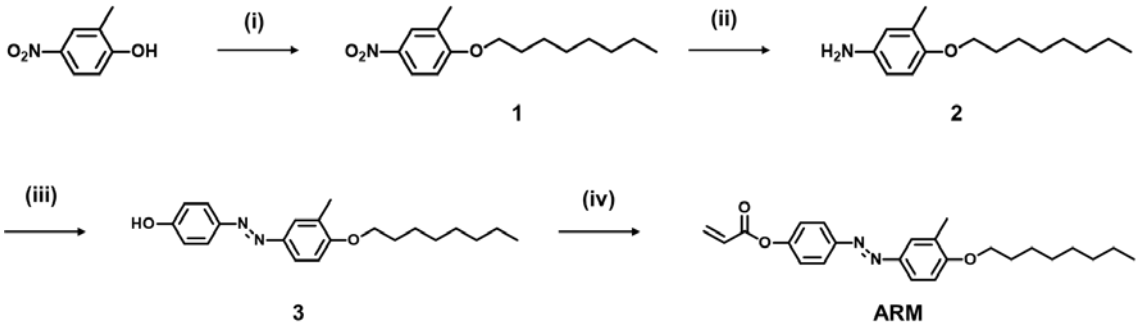


Fig. S1 Synthetic procedures of ARM. (i) 1-bromooctane, K_2CO_3 and acetone at 60 °C for 12 h; (ii) hydrazine hydrate, raney nickel and EtOH at 45 °C for 2 h; (iii) HCl, $NaNO_2$, NaOH solution, phenol at 5 °C. (iv) DCC, DMAP, acrylic acid and DCM at r.t. for 48 h.

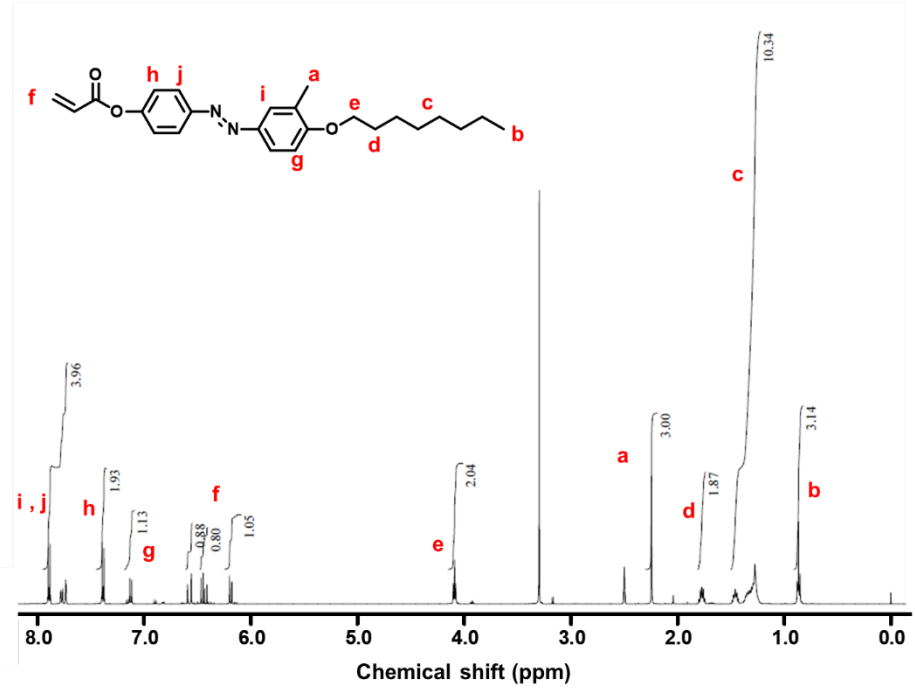


Fig. S2 ^{1}H NMR spectra of ARM.

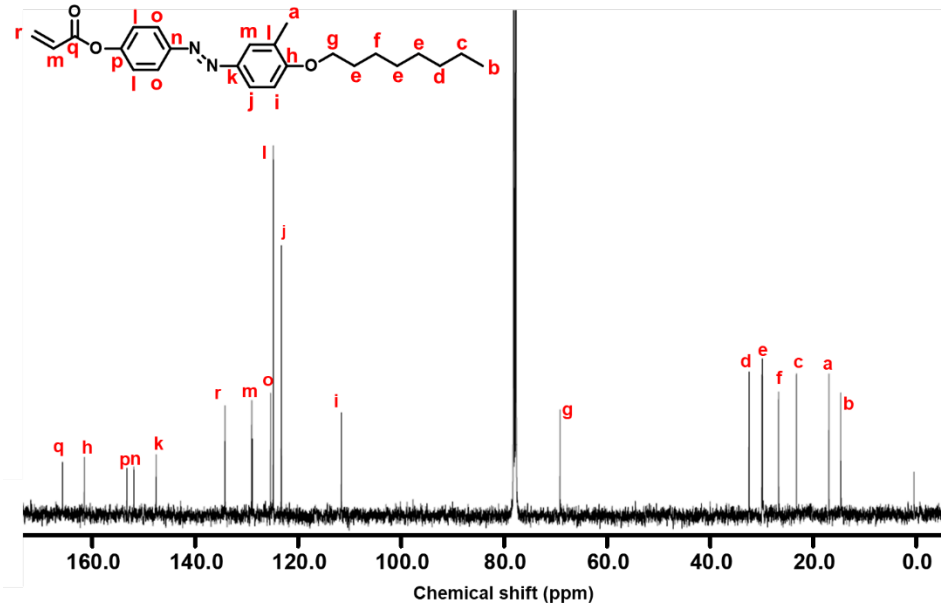


Fig. S3 ^{13}C NMR spectra of ARM.

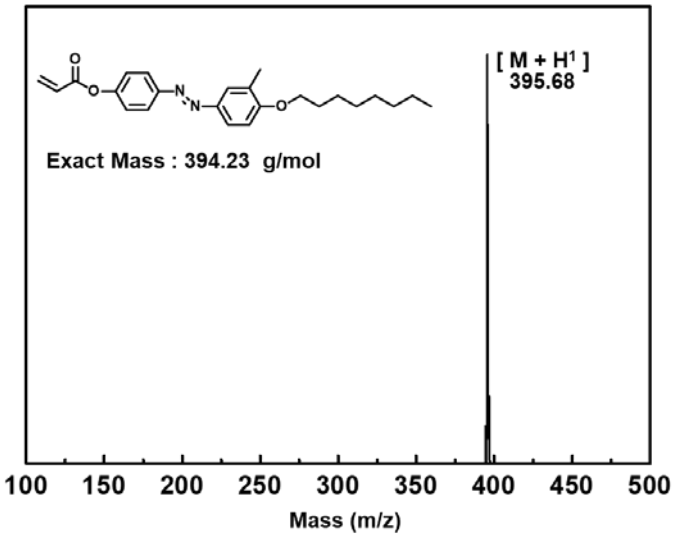


Fig. S4 ESI-MS spectra of ARM.

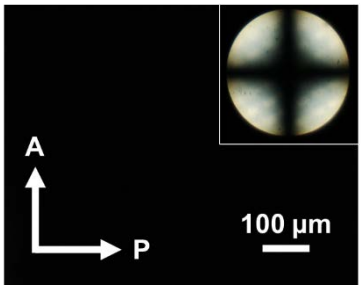


Fig. S5 Orthoscopic and conoscopic POM images of ARM LC command cell.

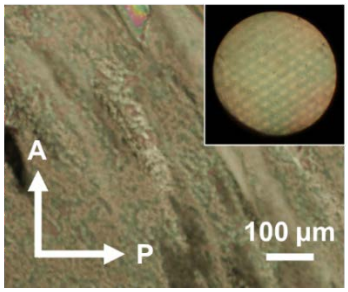
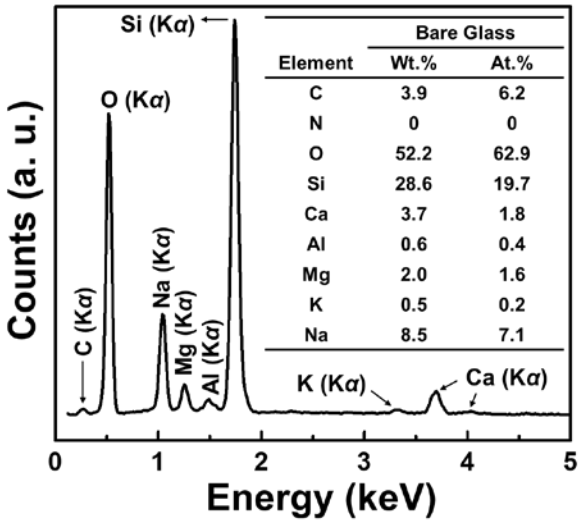


Fig. S6 Orthoscopic and conoscopic POM images of the cell made by the APTMS surface.



Element	Bare Glass Wt.%	Bare Glass At.%
C	3.9	6.2
N	0	0
O	52.2	62.9
Si	28.6	19.7
Ca	3.7	1.8
Al	0.6	0.4
Mg	2.0	1.6
K	0.5	0.2
Na	8.5	7.1

Fig. S7 EDS spectrum and elemental composition (inset) of bare glass.

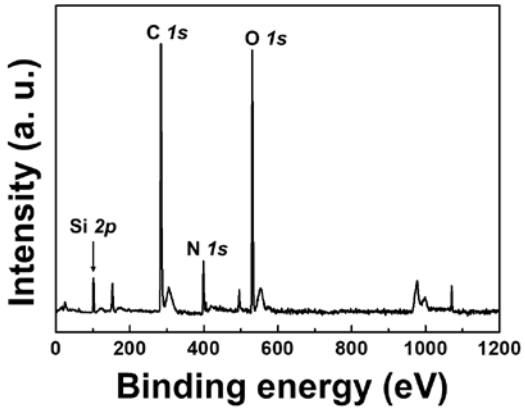


Fig. S8 XPS survey scans of ARM surface.

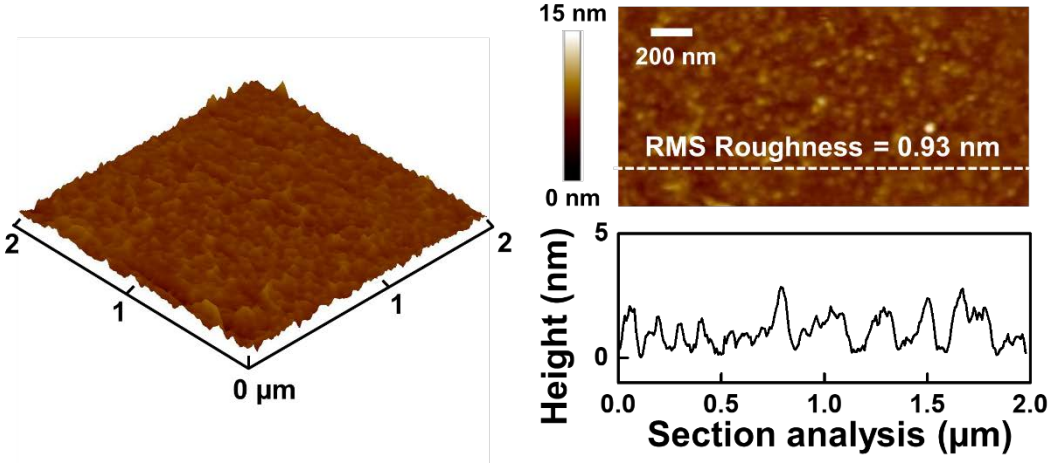


Fig. S9 AFM image, topological analysis and height profile of bare glass.

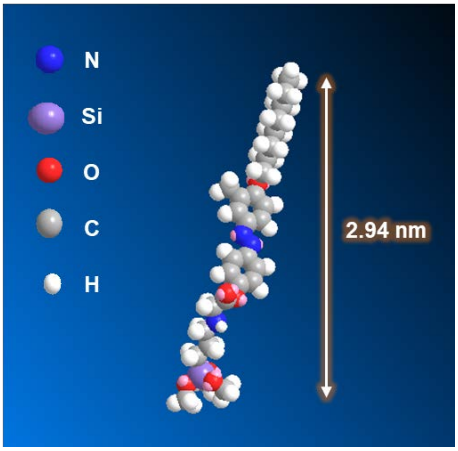


Fig. S10 Energy-minimized length of APTMS-ARM structure.

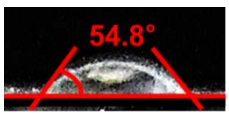


Fig. S11 Water contact angle measurement of ARM surface under UV light.

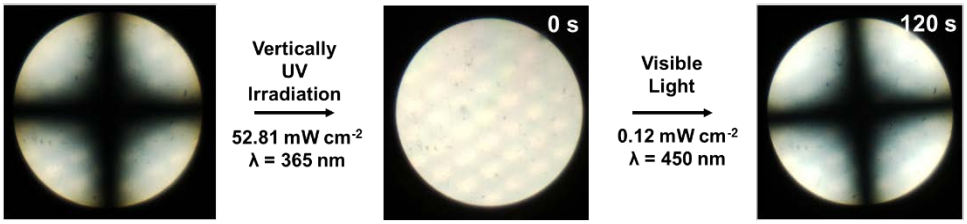


Fig. S12 Conoscopic images of LC command cell according to light source.

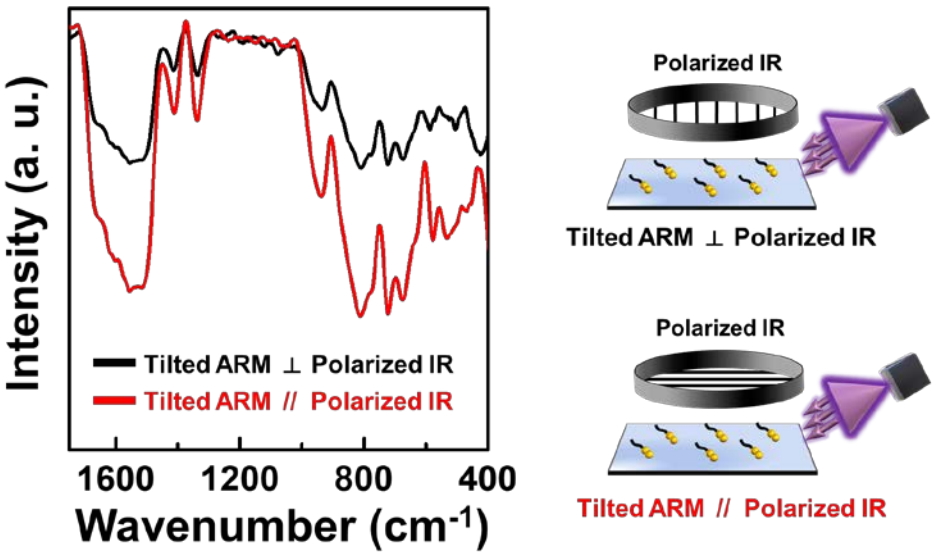


Fig. S13 Polarized FT-IR data (transmittance mode) and schematic illustration of polarized FT-IR experiment.

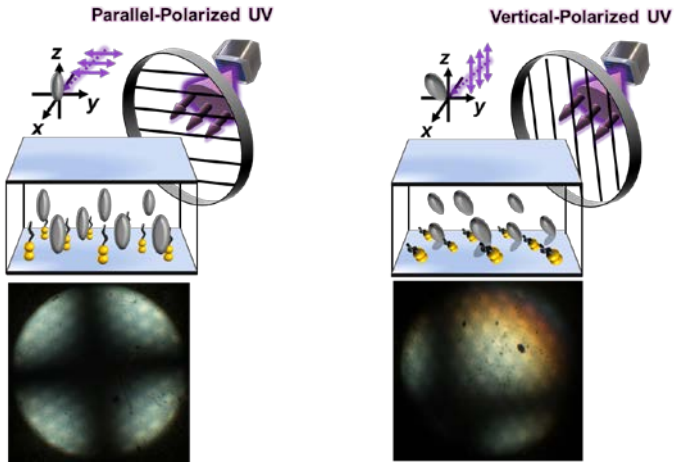


Fig. S14 Schematic illustration and conoscopic images of LC command cell when parallel- and vertical-polarized UV are irradiated diagonally.

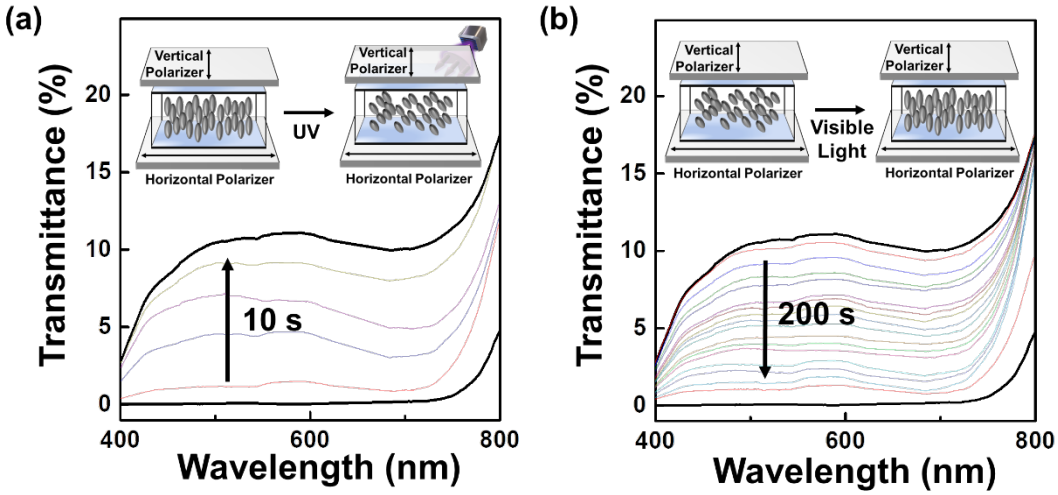


Fig. S15 Photo-induced transmittance change of LC command cell placed between the horizontal and vertical polarizer in (a) diagonal UV irradiation and (b) visible light. The schematic illustrations (insets) in (a,b) show the LCs that is modulated according to light source.