Supporting information

Ambipolar charge-trapping in self-assembled nanostructures of supramolecular miktoarm star-shaped copolymer with a zinc phthalocyanine core

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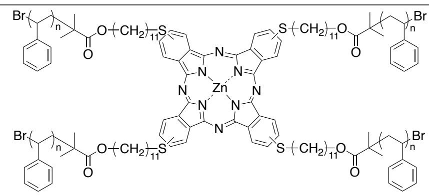
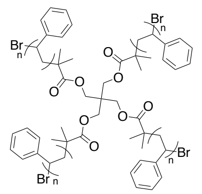
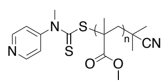
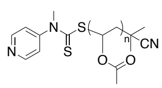
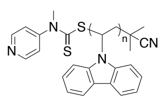
Table S1. List of polymers

Polymer	Molecular structure	M_n (Kg mol^{-1})[a]	M_w/M_n[a]	DP
ZnPcPS$_4$		14.2	1.09	36[b]
PS$_4$		16.1	1.10	39[b]
pyPMMA		13.9	1.12	132
pyPVAc		16.1	1.27	207
pyPVK		13.0	1.22	74

[a] Number-average molecular weight and polydispersity determined by GPC analysis. [b] Degree of polymerization (DP) estimated for each arm.

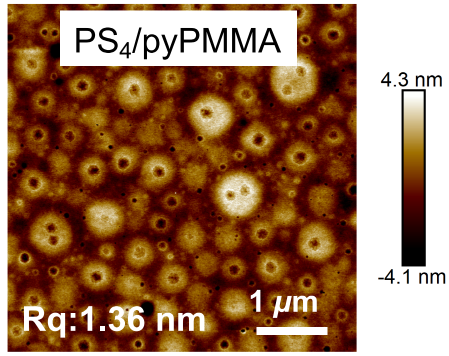


Figure S1. AFM height image of a polymer blend film of PS_4 and pyPMMA.

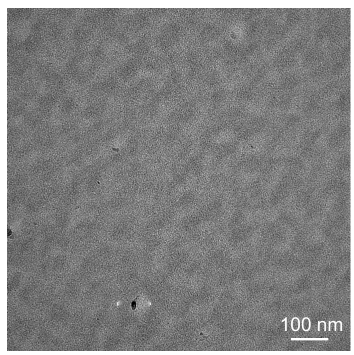


Figure S2. Bright-field TEM image of $ZnPcPS_4$/pyPMMA film.

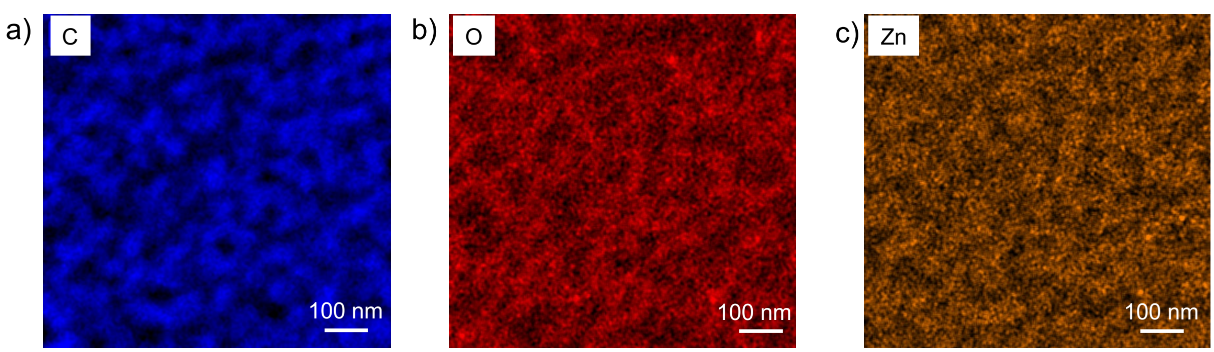


Figure S3. STEM-EDS elemental mapping image for carbon (a), oxygen (b), and Zn (c) of a polymer film of $ZnPcPS_4$/pyPMMA.

Table S2. Device performances of C8-BTBT-based OFET memory using polymer dielectrics

Memory layer	Initial V_{th} (V)	I_{on}/I_{off} (A)	Mobility ($cm^2\ V^{-1}\ s^{-1}$)	Hole-trapping $V_{th(-)}$[a] (V)	Electron-trapping $V_{th(+)}$[b] (V)	Memory window (V)	Memory ratio
$ZnPcPS_4$/pyPMMA	0.57	~10^8	0.31	–24.80	22.43	47.23	~10^7
$ZnPcPS_4$	–2.05	~10^7	0.26	–33.54	15.07	48.61	~10^6
pyPMMA	–12.15	~10^7	2.96	–17.42	–1.71	15.71	~10^7

[a] The threshold voltages $V_{th(-)}$ estimated after applying V_g = –60 V for 1 s. [b] The threshold voltages $V_{th(+)}$ estimated after applying V_g = +60 V under UV light for 5 s.

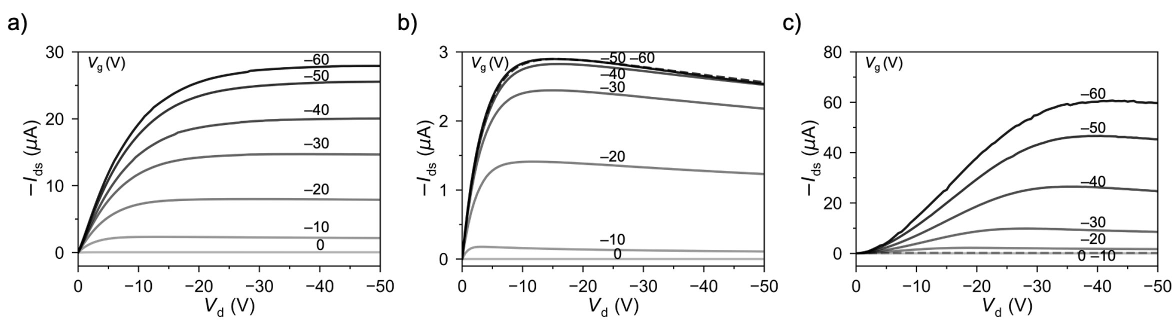


Figure S4. Output characteristics for OFET devices with $ZnPcPS_4$/pyPMMA (a), $ZnPcPS_4$ (b), and pyPMMA (c) layers.

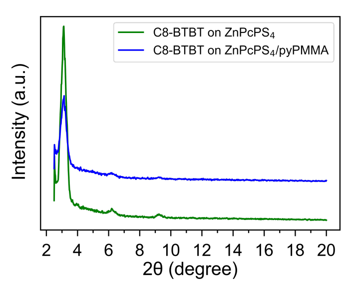


Figure S5. XRD profiles of the C8-BTBT films on $ZnPcPS_4$ (green line) and $ZnPcPS_4$/pyPMMA (blue line).

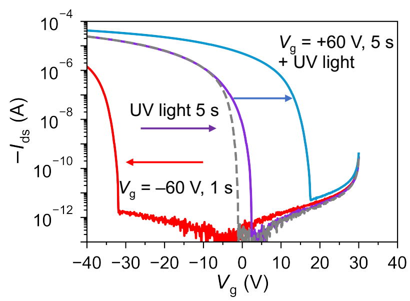


Figure S6. Transfer characteristics of OFET memory device with a polymer layer of $ZnPcPS_4$ at V_d = –50 V. Transfer curves were monitored at the initial state (gray), after electric writing (red), after photo-erasing (purple), and after photo-assisted writing (blue) operations.

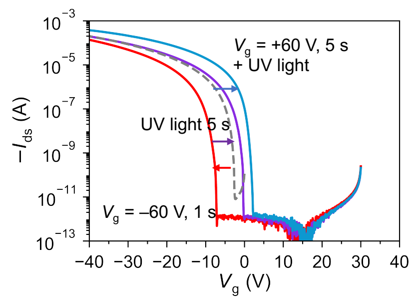


Figure S7. Transfer characteristics of OFET memory device with a polymer layer of pyPMMA at V_d = –50 V. Transfer curves were monitored at the initial state (gray), after electric writing (red), after photo-erasing (purple), and after photo-assisted writing (blue) operations.

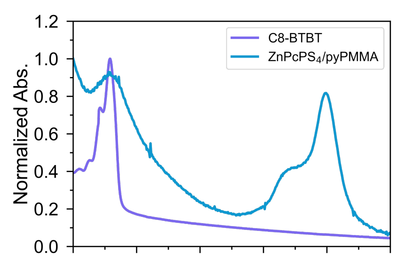


Figure S8. Absorption spectra of C8-BTBT film (purple line) and $ZnPcPS_4$/pyPMMA blend film (blue line).

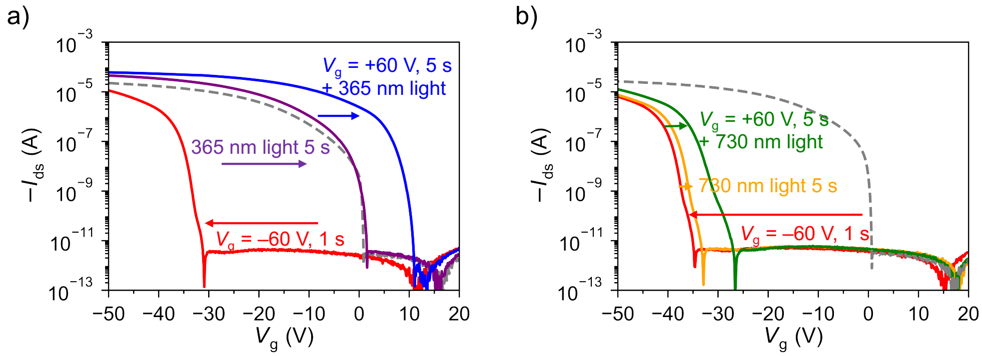


Figure S9. Transfer characteristics of OFET memory device with a polymer layer of $ZnPcPS_4$ at V_d = –50 V by LED light irradiation at (a) 365 nm and (b) 730 nm.

The transfer curve at the initial state (gray dashed line) was shifted after applying V_g = –60 V for 1 s (red line). Subsequent irradiation of 365 nm LED light for 5 s shifted the transfer curve to the initial state (purple line Figure S9a). Simultaneous exposure to V_g = +60 V and 365 nm light for 5 s shifted the transfer curve to the positive direction (blue line Figure S9a). While irradiation of 730 nm LED light for 5 s (orange line Figure S9b) and simultaneous exposure to V_g = +60 V and 730 nm light for 5 s (green line Figure S9b) resulted in only slight positive shift.

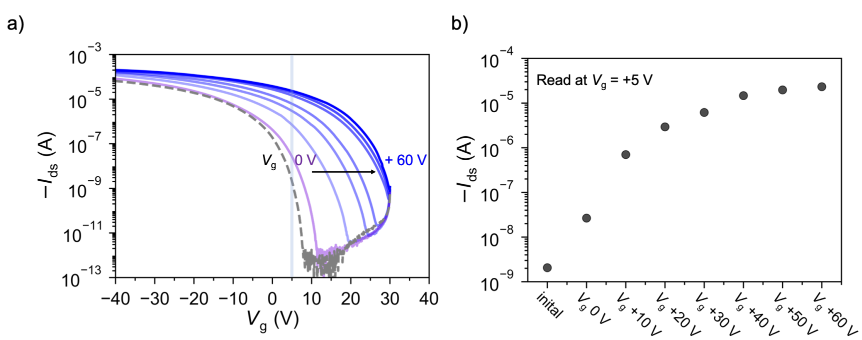


Figure S10. (a) Transfer characteristics of the OFET memory device with $ZnPcPS_4$/pyPMMA memory layer at V_d = –50 V after applying various positive V_g under the UV light irradiation for 5 s. (b) Drain current read at V_g = +5 V and V_d = –50 V after applying various positive V_g with UV light for 5 s.

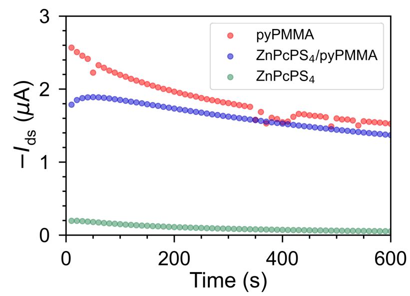


Figure S11. Retention time of I_{ds} monitored at V_g = 0 V and V_d = –10 V after photo-assisted programming of OFET memory devices with pyPMMA (red circle), $ZnPcPS_4$/pyPMMA (blue circle) and $ZnPcPS_4$ (green circle) layers.

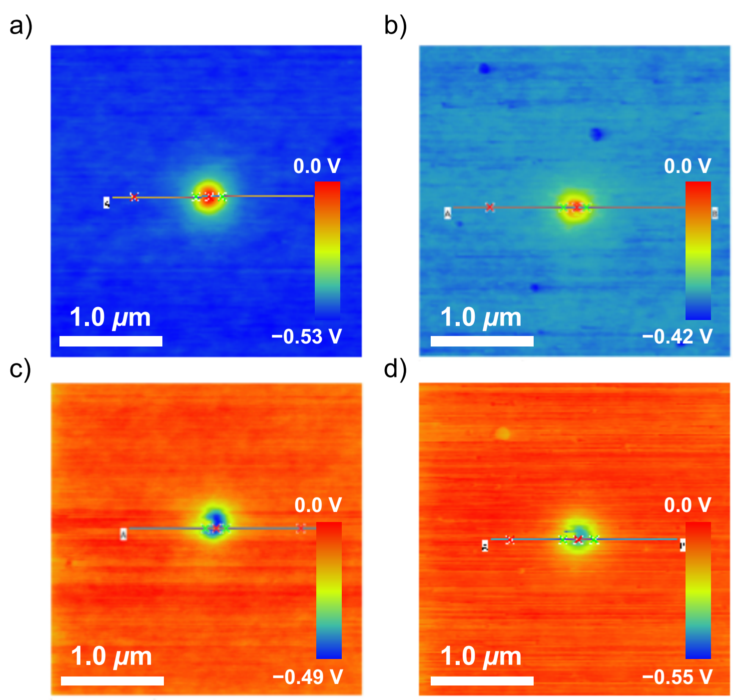


Figure S12. Surface potential images after applying V_{tip} = +10 V onto $ZnPcPS_4$ (a) and pyPMMA (b). Surface potential images after applying V_{tip} = –10 V of $ZnPcPS_4$ (c) and pyPMMA (d).

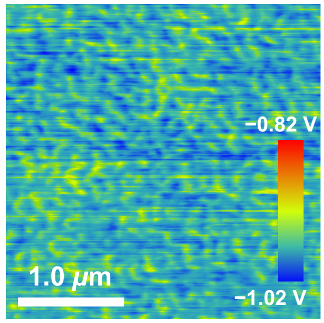


Figure S13. Surface potential image of $ZnPcPS_4$/pyPMMA film at the initial state.