Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Electronic Supplementary Information

Photosensitive Organic Field Effect Transistor: Influence of ZnPc Morphology and Bilayer Dielectrics to Achieve Low Operating Voltage and Low Bias Stress Effect

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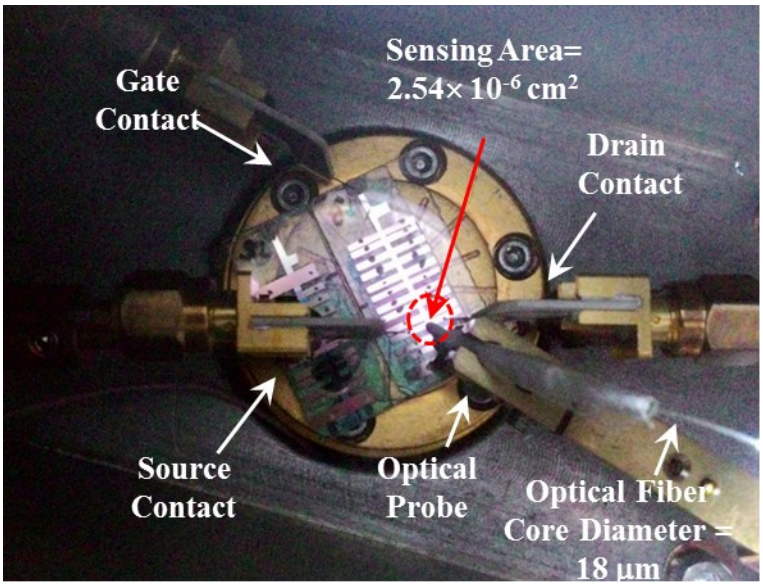

Fig. S1. Experimental setup for ZnPc based PS-OFET.

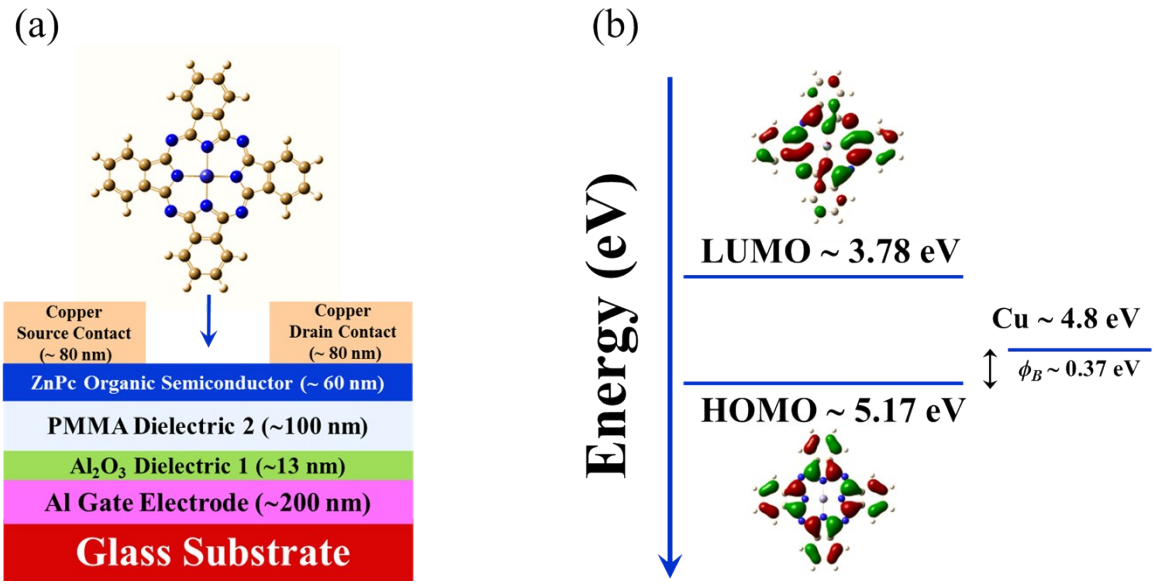

Fig. S2 (a) Cross-sectional schematic diagram of a top contact PS-OFET. (b) Illustration of simplified energy band diagram of ZnPc PS-OFET under zero bias condition, with barrier height Φ_B~0.37 eV.

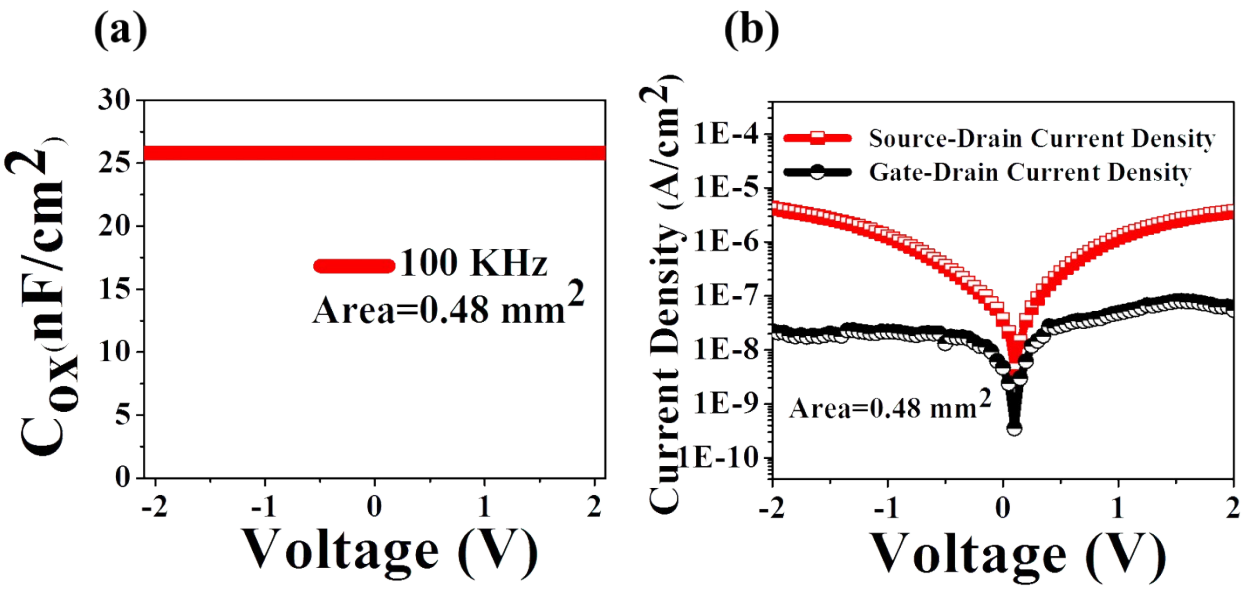

Fig. S3 (a) Capacitance of Al_2O_3 / PMMA gate insulators as a function of voltage at 100 kHz and (b) Leakage current density, J ($A.cm^{-2}$) vs. bias voltage (V), characteristics of MIM structures bilayer gate dielectric system.

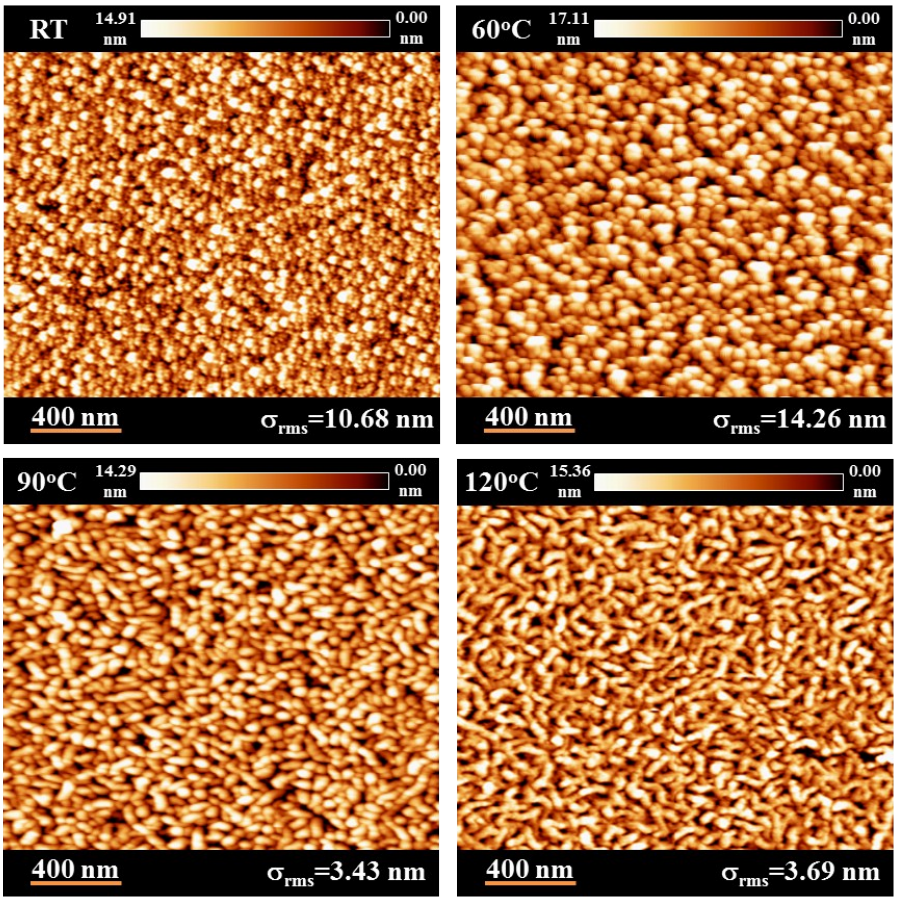

Fig. S4 AFM topography images (2μm×2μm) of 60nm ZnPc thin films deposited on top of Al_2O_3/PMMA bilayer gate dielectric at RT, 60 °C, 90 °C and 120 °C respectively.

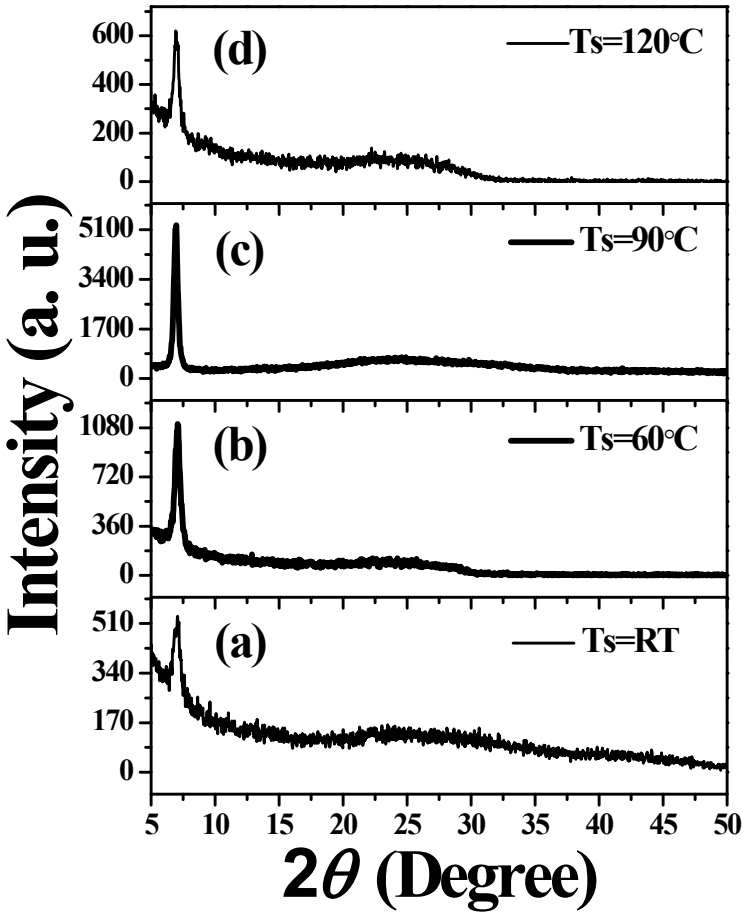

Fig. S5. X-ray diffractograms of ZnPc thin films deposited on PMMA coated glass substrate at Ts= (a) RT, (b) 60°C, (c) 90°C and (d) 120°C respectively.

Table S1. X-ray diffraction analysis of ZnPc films prepared on PMMA coated glass substrate at different Ts.

Ts (°C)	2θ (Degree)	d-spacing, d (Å)	Particle size, D (nm)
RT	6.97	12.511	9.51
	22.44	3.999	
	42.21	2.139	
60	7.06	12.672	18.37
	22.21	3.959	
90	6.93	12.740	22.74
	24.21	3.673	
	41.91	2.154	
120	6.96	12.687	19.18
	22.41	3.97	

Table S2. Summary of other small molecule based organic photo sensitive transistor with their respective device structure.

Method	Organic Semiconductor	Device structure	Mobility (cm^2 /Vs)	Responsivity (Light source, Intensity)	I_{ph} / I_{dark}	Ref.
Vapor	BPTT	BG/TC (SiO_2)	0.082	82 A/W (380 nm, 1.55 mW/cm^2)	2×10^5	14
	CuPc	BG/TC (SiO_2)	0.02	0.5–2 A/W (365 nm, 1.55 mW/ cm^2)	3×10^3	20
	F_{16}CuPc	BG/TC (P4PMS)	5.3×10^{-4}	1.5 mA/W (White light, 5.66 mW/ cm^2)	22	36
		TG/BC (CL-PVP)	1.05×10^{-4}	1.4 mA/W (White light, 5.98 mW/ cm^2)	79	37
		TG/BC (CL-PVP)	4.6×10^{-4}	2.15 mA/W (White light, 5.66 mW/ cm^2)	300	38
	Pentacene	BG/TC (SiO_2)	0.49	10–50 A/W (365 nm, 1.55 mW/ cm^2)	1.3×10^5	20
		BG/TC (PMMA)	0.01	0.015 A/W (365 nm, 7 mW/ cm^2)	2×10^4	39
	6T	BG/TC (SiO_2)	0.09	1.5–2.4 A/W (365 nm, 1.55 mW/ cm^2)	1.3×10^3	10
	Tetracene	BG/TC (SiO_2)	0.003	NA (364 nm, 0.64 mW/ cm^2)	3×10^3	40
	ABT	BG/TC (SiO_2, OTS)	0.4	1000 A/W (White light, 30 μ W/ cm^2)	800	41
	DPASP	BG/BC (SiO_2, HMDS)	$0.67\text{-}6.8\times10^{-7}$	0.1 A/W (White light, 0.96 mW/ cm^2)	100	42
	Spiro-DPSP	BG/BC (SiO_2, HMDS)	1.3×10^{-6}	1 A/W (370 nm, 191 μ W/ cm^2)	5×10^2	12
	Spiro-DPSP 2	BG/BC (SiO_2, HMDS)	2.7×10^{-7}	0.44 A/W (370 nm, 64 μ W/ cm^2)	2.1×10^3	43
	Spiro-4P-CPDT	BG/BC (SiO_2, HMDS)	$1 - 2\times10^{-4}$	25 A/W (370 nm, 2.4 μ W/ cm^2)	290	22
Vapor/ Solution	Pentacene/PC_{60}BM	BG/BC (ODPA)	$0.1\text{-}10^{-3}$	NA (469 nm, 3.2 mW/ cm^2)	10^3	44