Supporting Information

Photochromic Inorganic-Organic Complex Derived from Low-cost Deep Eutectic Solvents with Tunable Photocurrent responses and Photocatalytic Properties

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Table S1. Crystal data and structure refinement for $|C_{10}H_{10}N_2|[GaF(C_2O_4)_2]$.

Empirical formula	$C_{14}H_{10}FGaN_2O_8$
Formula weight	422.96
Temperature	293(2) K
Wavelength(Å)	0.71073
Crystal system, space group	Monoclinic, C2/m
Unit cell dimensions	
a (Å)	18.4449(10)
b (Å)	10.4561(5)
c (Å)	3.8127(2)
α(deg)	90
β(deg)	93.617(2)
γ (deg)	90
Volume(Å^3)	733.86(7)
Z, calculated density(mg m^{-3})	2,1.914
Absorption coefficient(mm^{-1})	1.940
F(000)	424
Crystal size(mm^3)	0.245 × 0.123× 0.104
θ range(°) for data collection	3.85–27.456
Limiting indices	$-23 \le h \le 23$, $-13 \le k \le 13$, $-4 \le l \le 4$
Reflections collected/unique	5805/ 882, [*R*(int) = 0.0248]
Completeness to θ (%)	25.242, 99.4
Absorption correction	semi-empirical from equivalents
Refinement method	full-matrix least-squares on F^2
Data/restraints/parameters	882/6/67
Goodness-of-fit on F^2	1.167
Final *R* indices [$I > 2\sigma(I)$]	$R_1 = 0.0272$, $wR_2 = 0.0680$
R indices (all data)	$R_1 = 0.0272$, $wR_2 = 0.0680$
Largest diff. peak and hole (eÅ^{-3})	0.534 and -0.496

$^aR_1 = \sum(\Delta F/\sum(F_o))$, $wR_2 = (\sum[w(F_o^2 - F_c^2)])/\sum[w(F_o^2)^2]^{1/2}$ and $w=1/[\sigma^2(F_o^2)+(0.0595P)^2+2.8937P]$ where $P=(F_o^2+2F_c^2)/3$

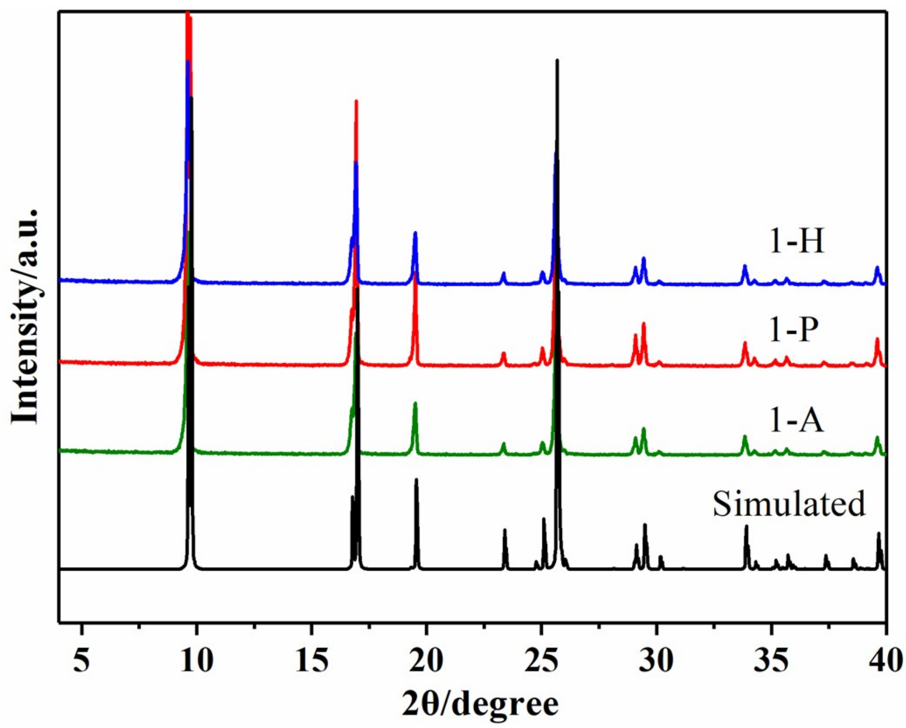

Figure S1. PXRD pattern of $|C_{10}H_{10}N_2|[GaF(C_2O_4)_2]$.

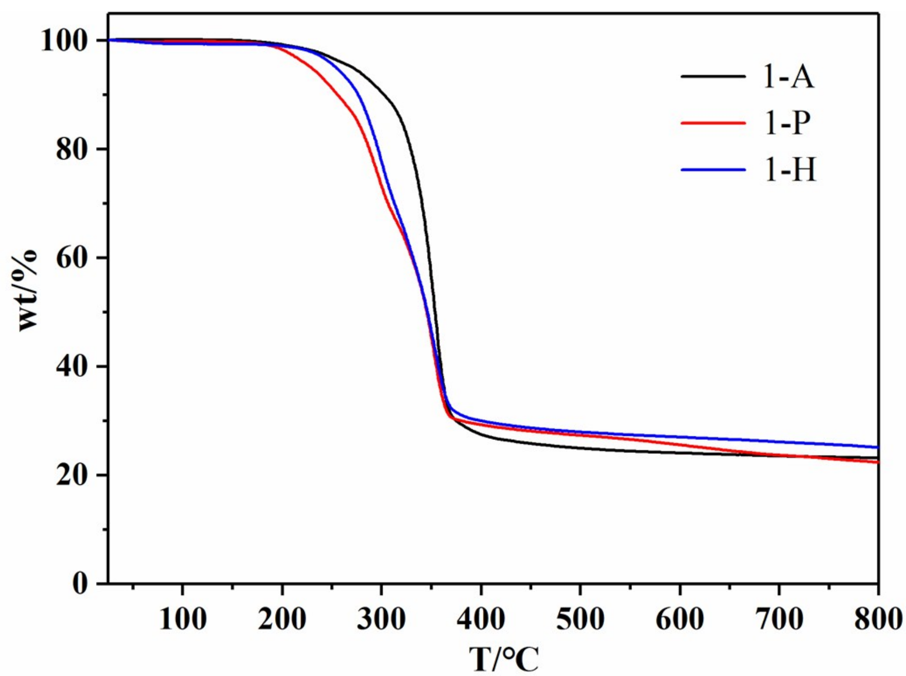

Figure S2. TG curve of $|C_{10}H_{10}N_2|[GaF(C_2O_4)_2]$.

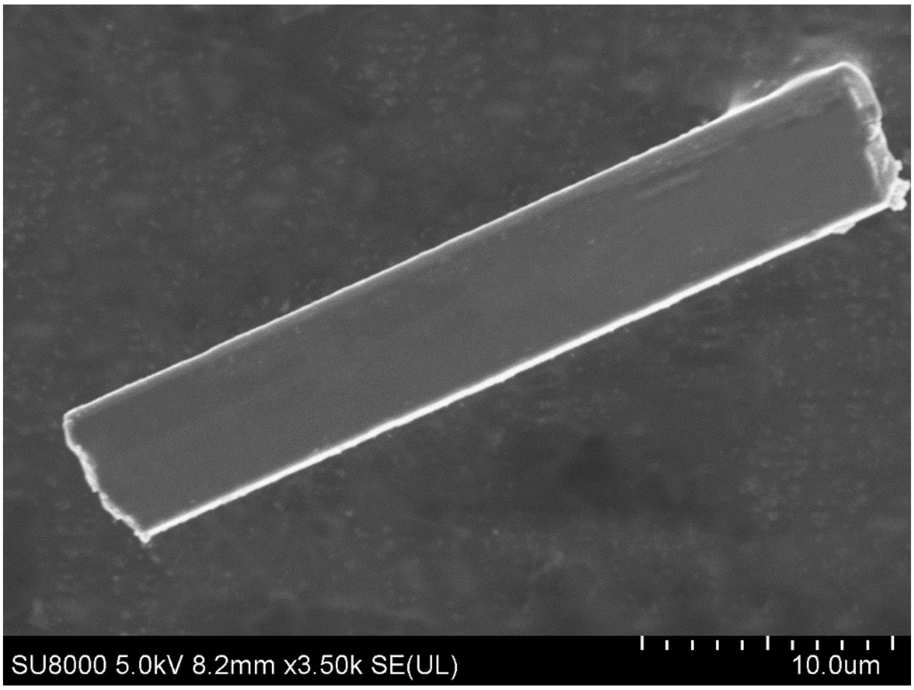

Figure S3. SEM image of $|C_{10}H_{10}N_2|[GaF(C_2O_4)_2]$.

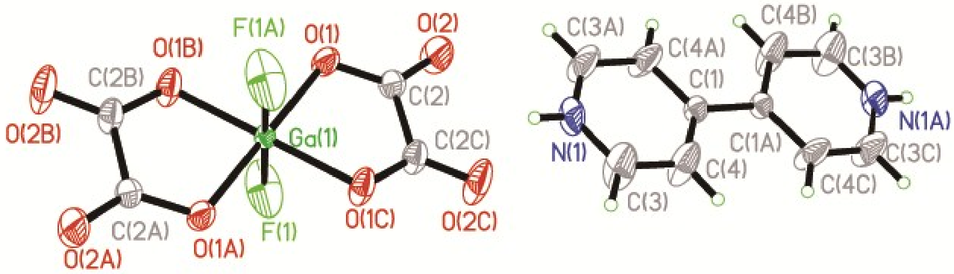

Figure S4. Thermal ellipsoids of $|C_{10}H_{10}N_2|[GaF(C_2O_4)_2]$ given at 50% probability, showing the atomic labelling scheme.

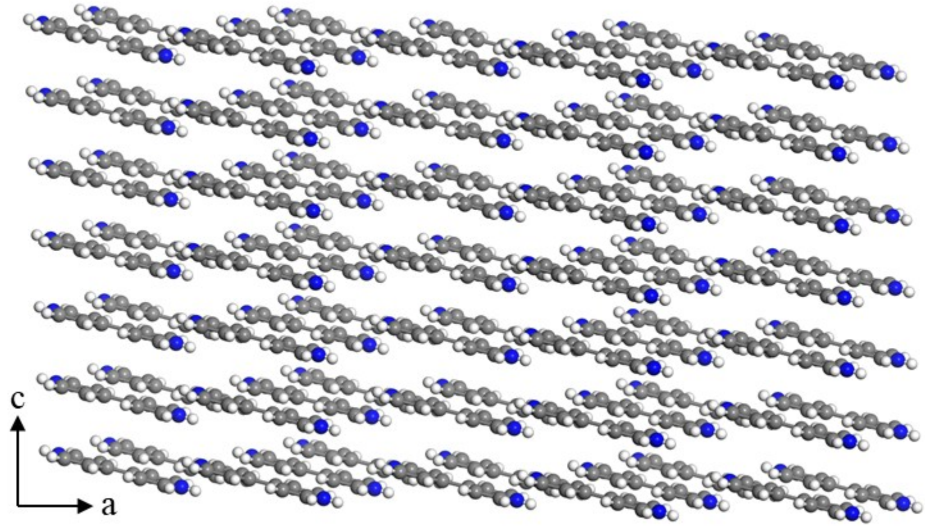

Figure S5. Dense packing mode of H_2bpy^{2+} cations along the [010] direction displaying the π –π stacking interactions between the adjacent pyridinium rings of the H_2Bpy^{2+} dications.

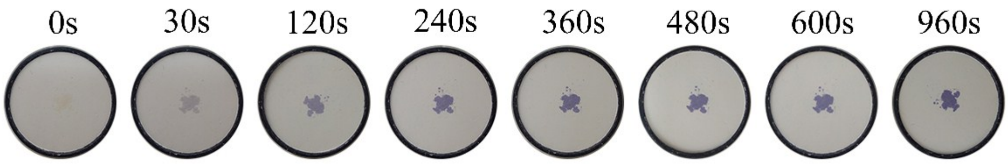

Figure S6. Colourless to purple upon light irradiation (48W UV light)

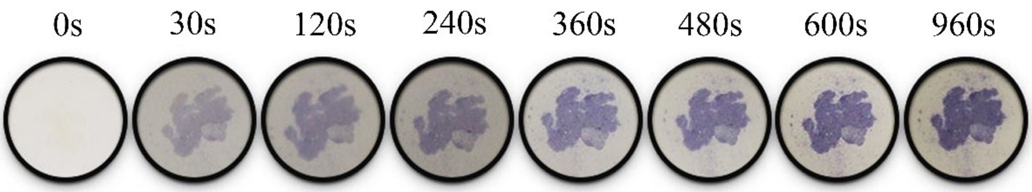

Figure S7. Colourless to purple upon light irradiation (300W visible light)

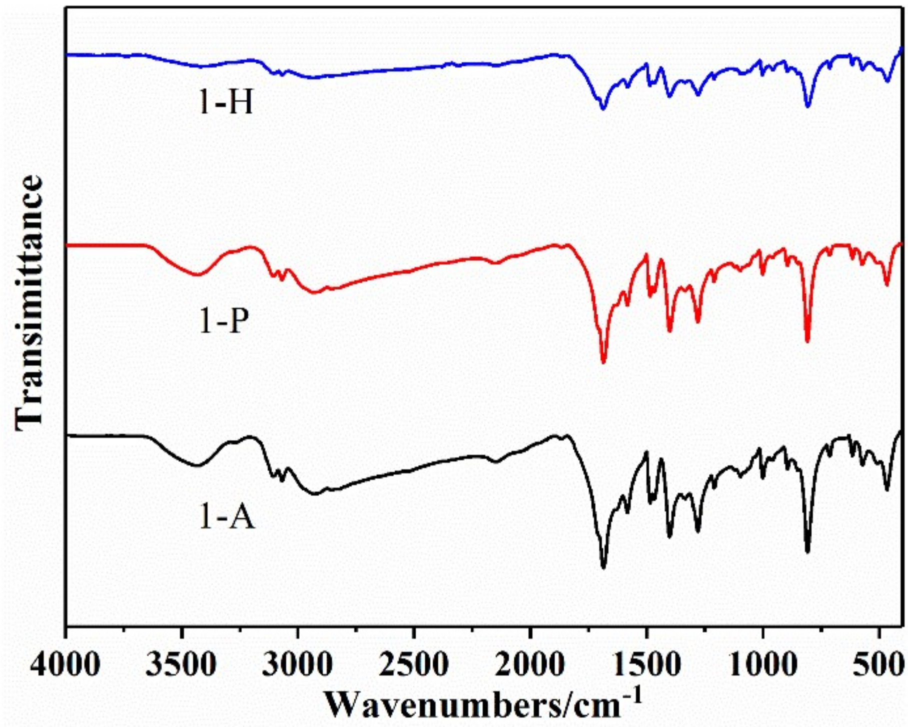

Figure S8. IR curves of |$C_{10}H_{10}N_2$|[$GaF(C_2O_4)_2$].

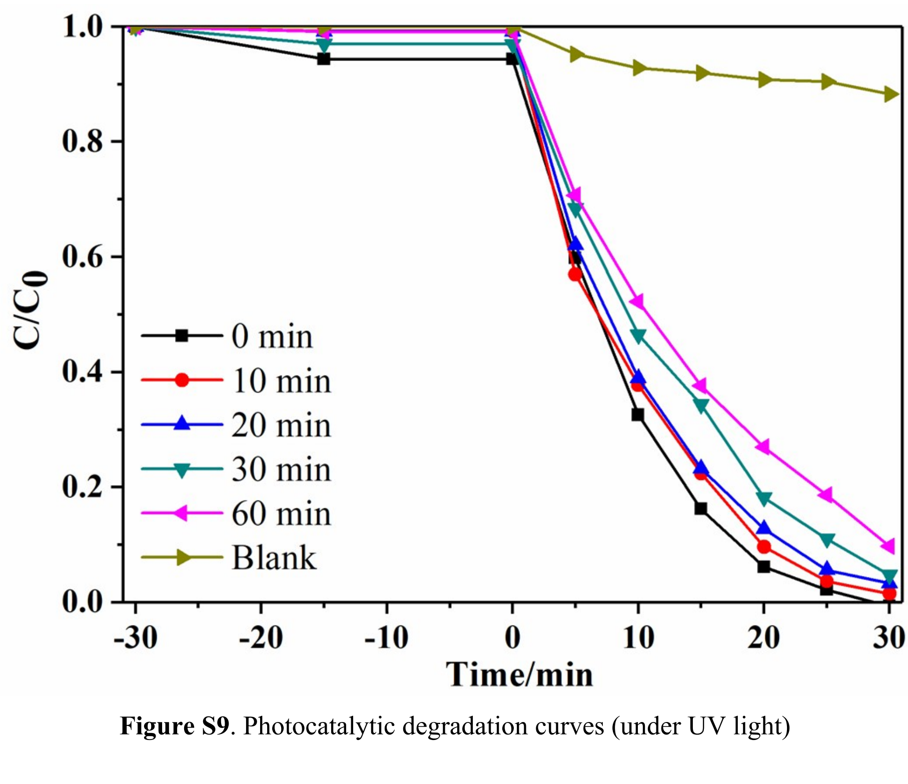

Figure S9. Photocatalytic degradation curves (under UV light)

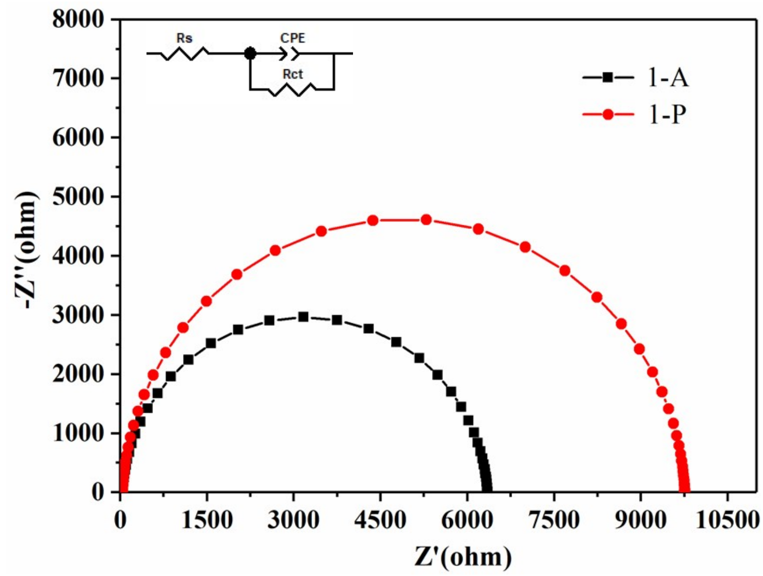

Figure S10. Nyquist impedance plots the corresponding equivalent circuit of **1-A** and **1-P**.

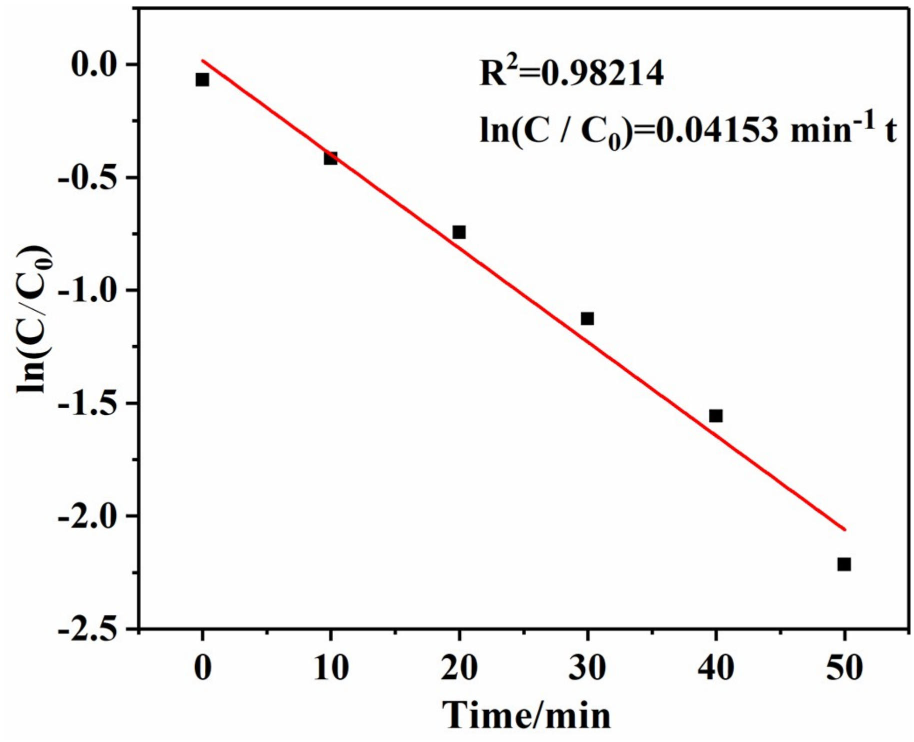

Figure S11. Linear relationship between ln(C_0/C) and irradiation time for photodegradation of RhB over **1-A**.

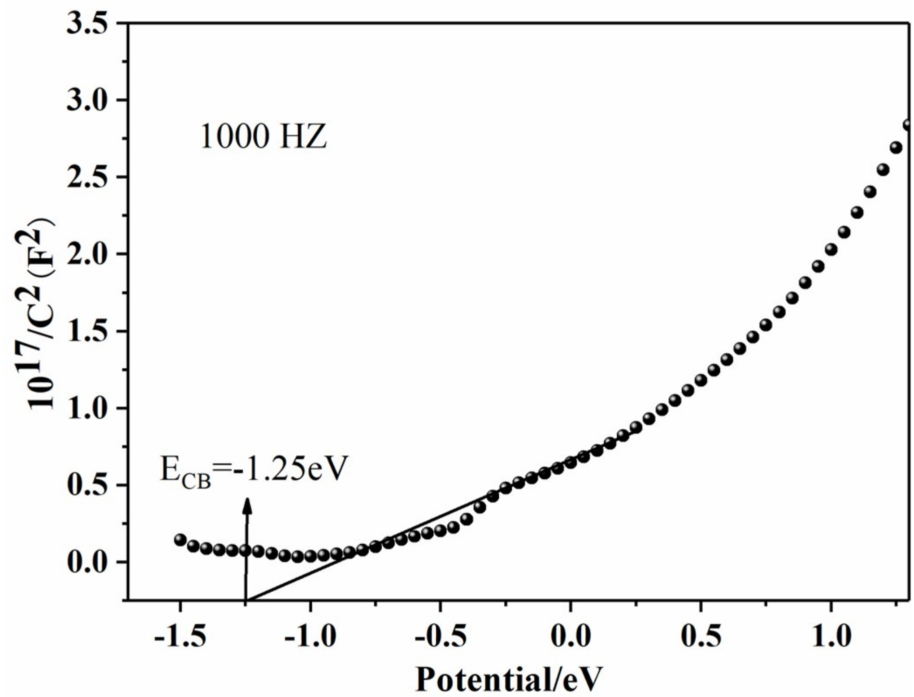

Figure S12. Mott-Schottky plot of **1-A**.

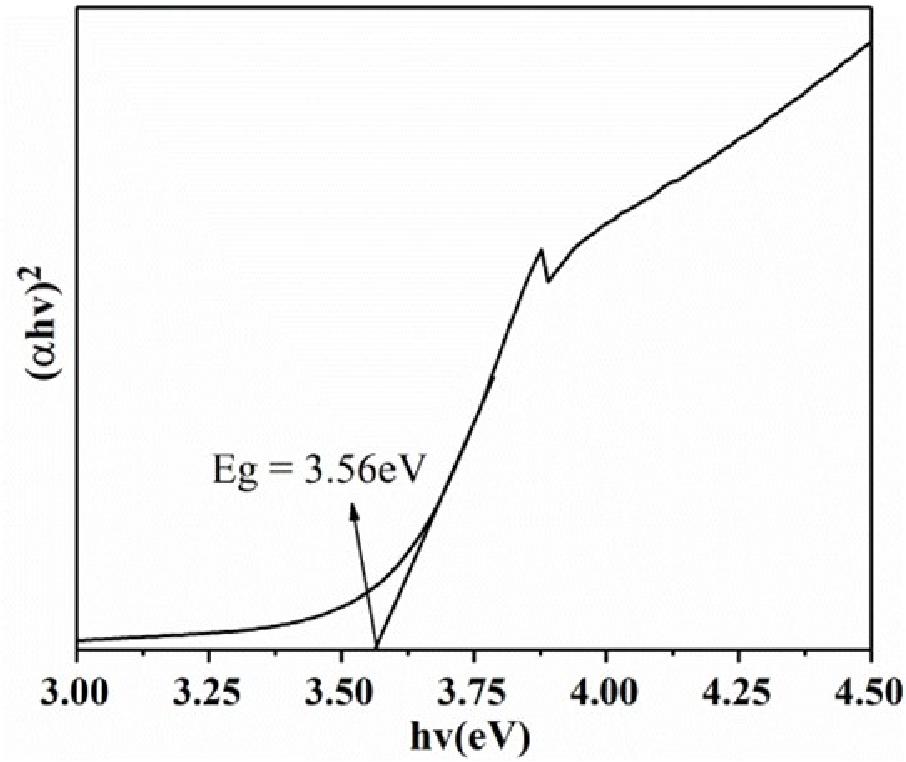

Figure S13. Plot of $(\alpha hv)^2$ as a function of *hv* for the bandgap energy of **1-A**, exhibiting its bandgap energy estimated to be 3.56 eV.

Table S2 Summary of photochromic performances in this work compared with literatures

Entry	sample name	Light sources	Irradiation intensity	Response time	Color transformation	Bleach condition	Ref
1	|C12H14N2|[Zn6(PO4)4(HPO4)(H2O)2]	UV light	-	several hours	colorless to blue	230℃ for 1 h in air.	1
2	[Cd(CEbpy)(m-BDC)(DMF)]·2H2O	UV light	175W	2min	yellow to darker blue	140℃ for 4 ~ 6 h .	2
3	[Zn(HPO3)(4,4′-bipy)0.5]	Xe lamp	300W	>3min	colorless to pink	145°C for 2 hours in air.	3
4	[Zn(bcbpy)0.5(pma)0.5(H2O)]·3H2O	UV light	300W	5s	colorless to blue	50°C for 20 min in air.	4
5	(MV)Bi2Cl8	UV light	-	-	Yellow to black	130°C in air	5
6	[Zn2(Bpy)(CTA)4]	Xe lamp	300W	-	colorless to purple	130°C for 2h in air.	6
7	[Cd1.5(H2L)0.5(Cl)3(CH3OH)]n	Xe lamp	300W	a few minutes	pale yellow to blue	120°C for 20 min in air.	7
8	[Mg2(1,4-NDC)2(H2O)2](bpy)(H2O)4	Xe lamp	500W	10min	colourless to blue	60°C for 20 min.	8
9	[Zn(HCOO)2(4,4′-bipy)]	Xe lamp	300 W	-	pale yellow to olive green	120°C for 2h.	9
10	Eu2(m-BDC)4(MV)	Xe lamp or sunlight	-	-	brown to green	-	10
11	[H2CPBPY]·[H2BTEC]	Xe lamp	150 W	-	pale yellow to green	130°C in air.	11
12	TbMOF	Xe lamp	300 W	-	bright yellow to dark green	120°C for 1h in air.	12
13	[Cd(CPBPY)(m-BDC) ·H2O	Xe lamp	-	-	yellow to blue	120°C	13
14	(hMV)[Bi(hMV)Cl5]	Hg UV lamp	150 W	a few minutes	white to blue	120°C for few minutes.	14
15	[Cd(CPBPY)(o-BDC)(H2O)]·H2O	UV light	-	-	yellow to gray	exposed to pure O2 or air, return	15

						slowly.	
16	[Zn(L1)(L3)0.5]·H2O	Xe lamp	250 W	20s	pale yellow to pale green	130 °C for 5 min.	16
17	{[Zn3(Cebpy)2(Hbtc)(H2btc)2(OH)2]·4H2O}n	Xe lamp	-	10min saturated	pale yellow to dark blue	80 °C for 2 hours.	17
18	NTHU-9	X-rays	-	-	orange to slate gray	200°C for 12h in air.	18
19	[H2(Bpy)][H3(Pma)]2	Xe lamp	300 W	-	yellow to grayish purple	80 °C for 3 min.	19
20	[Cd2(ic)(mc)(4,4'-bipy)3]n·4nH2O	light with λ<460 nm	-	-	yellow to blue	80°C for several hours.	20
21	$\vert$C10H10N2$\vert$[GaF(C2O4)2]	UV light	48W	10s	colorless to purple	110°C for 30 min.	This work

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