

**A Multistimuli-Response Fluorescent Switch in the Solution and
Solid State Based on Spiro[fluorene-9,9' -xanthene] -
Spiropyran**

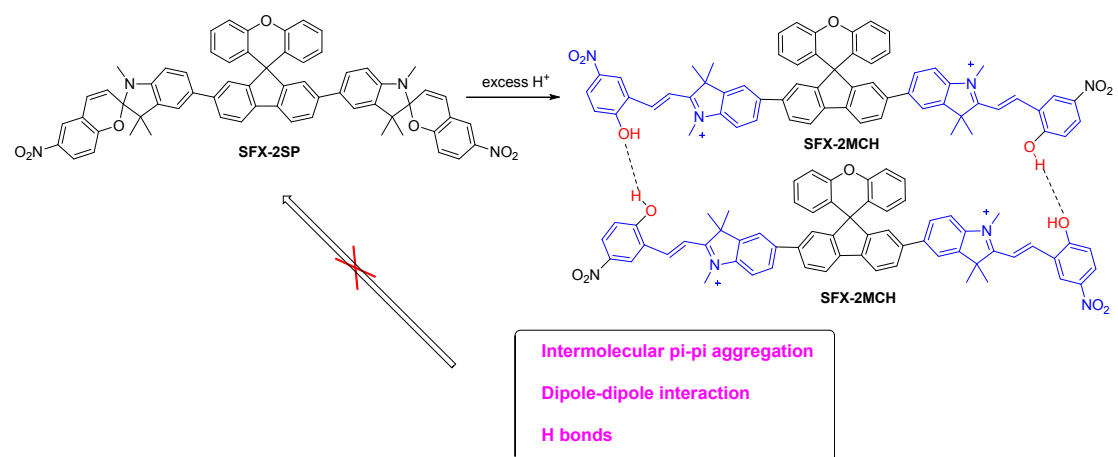
Lingyun Wang *, Wei Xiong, Hao Tang, Derong Cao

School of Chemistry and Chemical Engineering, South China University of Technology,

Guangzhou, China, 510640

*Corresponding author: Tel. +86 20 87110245; fax: +86 20 87110245. E-mail:

lingyun@scut.edu.cn



Scheme S1 The possible interactions of **SFX-2MCH** when **SFX-2SP** powder was exposed to excess gaseous HCl.

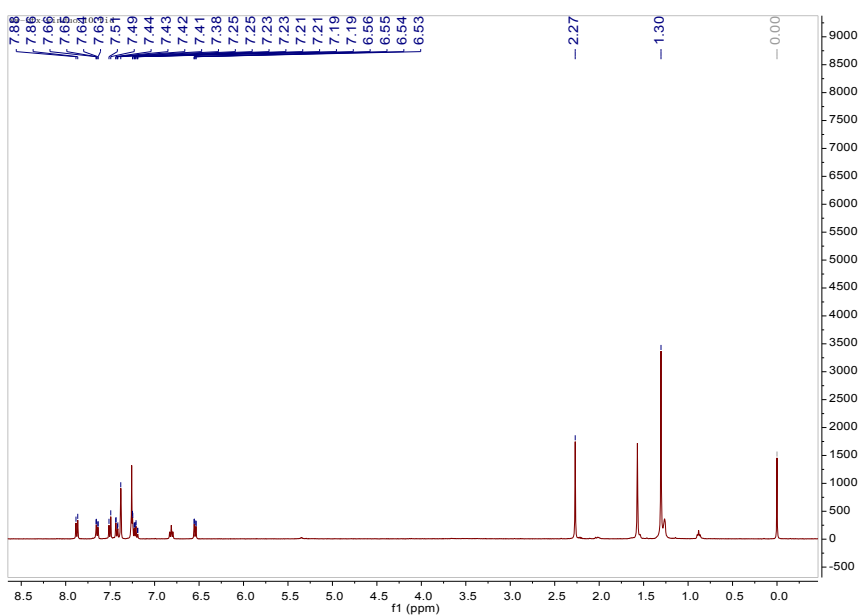


Figure S1 ^1H NMR spectrum of compound **3** in CDCl_3

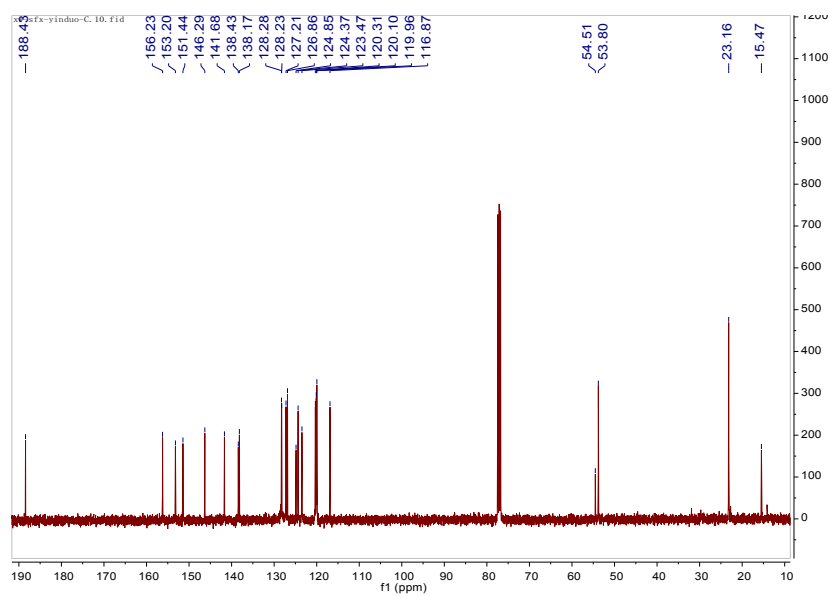


Figure S2 ^{13}C NMR spectrum of compound **3** in CDCl_3

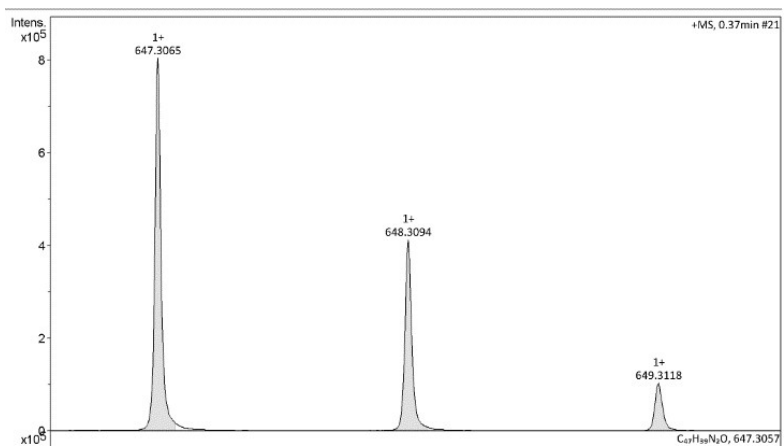


Figure S3 HRMS spectrum of compound 3

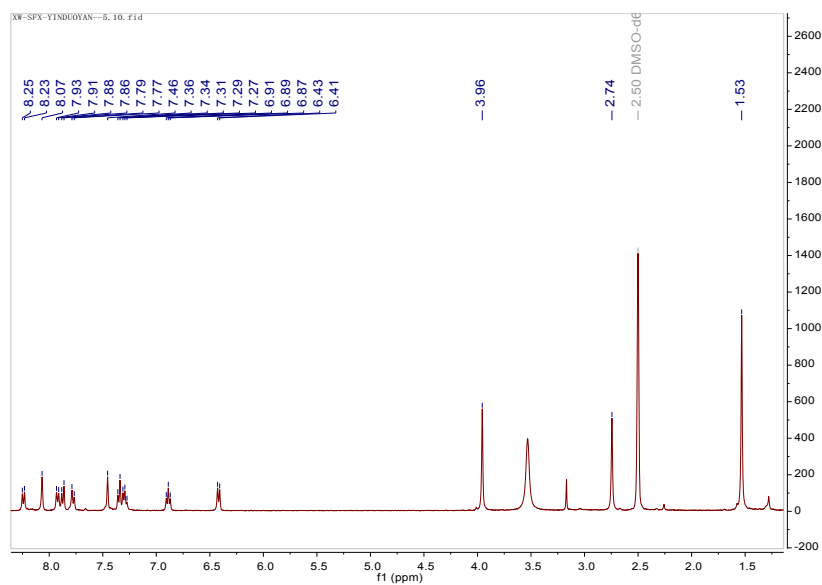


Figure S4 ¹H NMR spectrum of compound 4 in DMSO-*d*₆

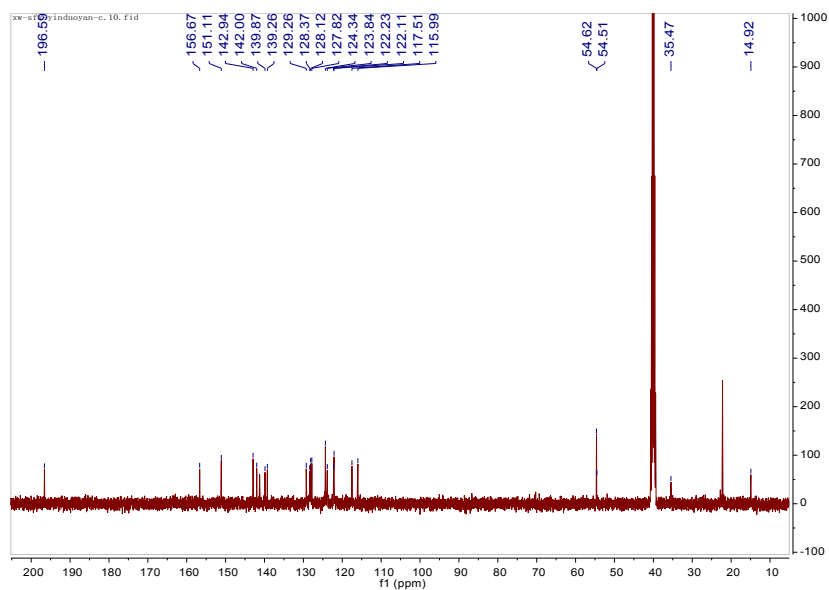


Figure S5 ^{13}C NMR spectrum of compound 4 in $\text{DMSO-}d_6$

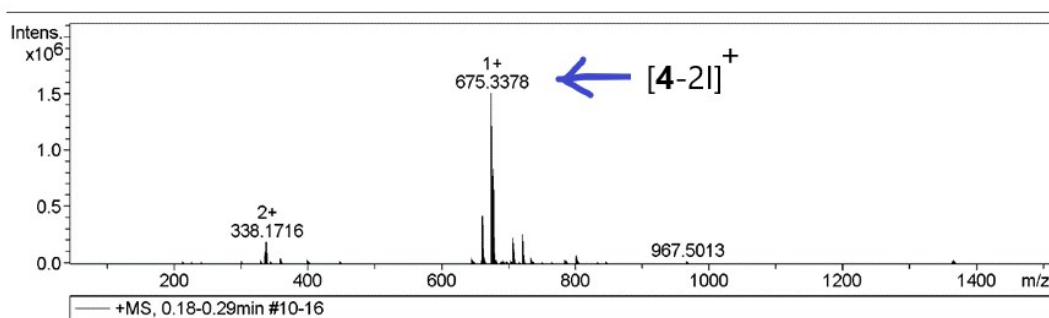


Figure S6 HRMS spectrum of compound 4

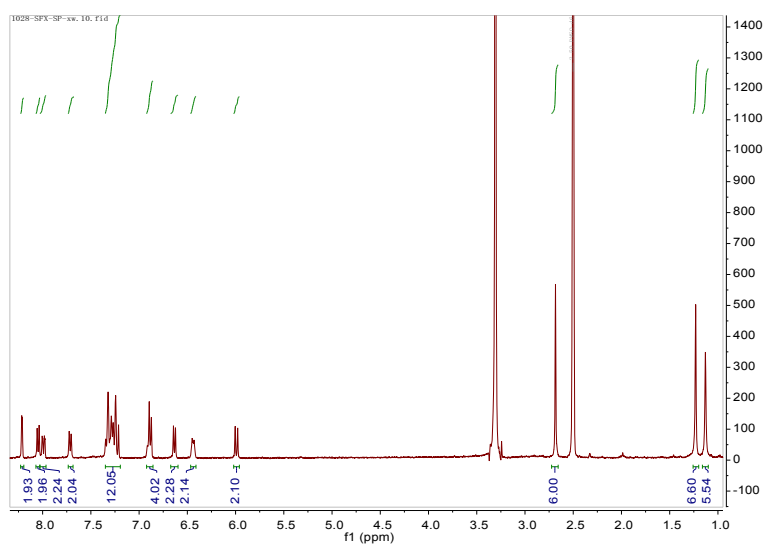


Figure S7 ^1H NMR spectrum of SFX-2SP in $\text{DMSO-}d_6$

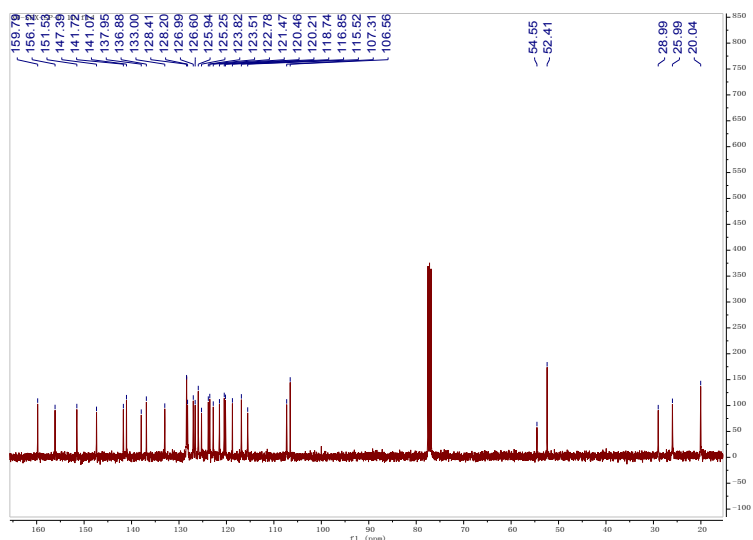


Figure S8 ^{13}C NMR spectrum of **SFX-2SP** in CDCl_3 .

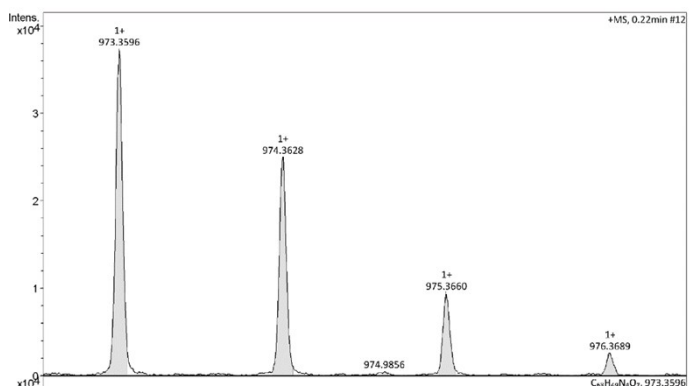
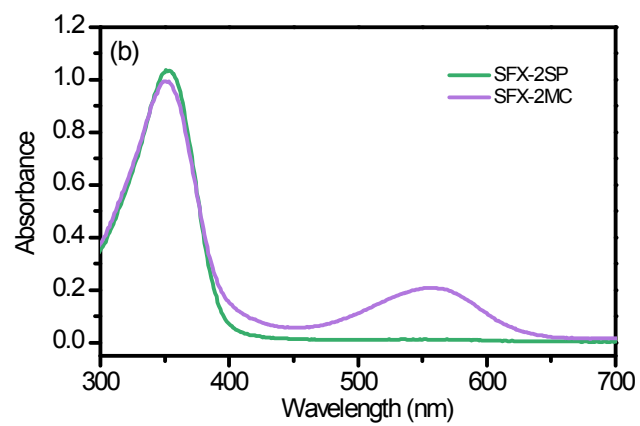
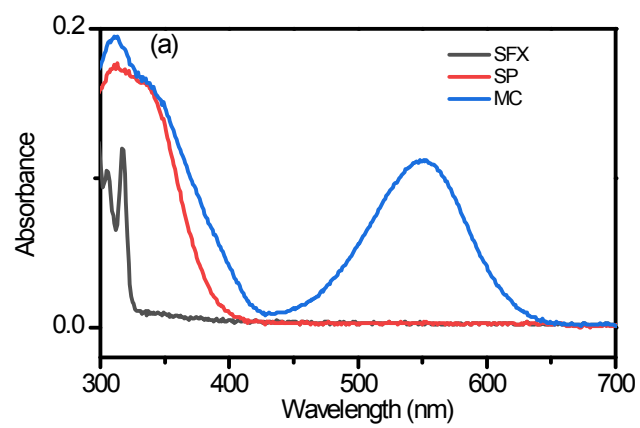
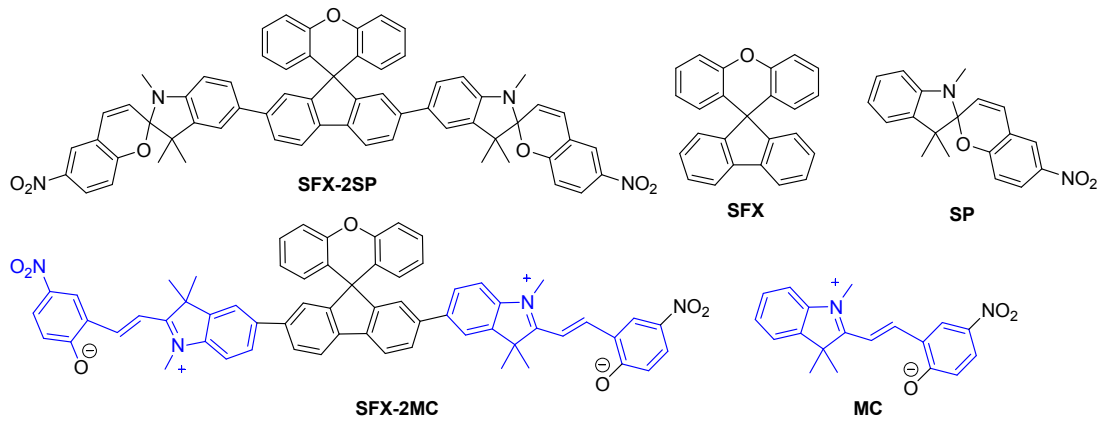


Figure S9 HRMS spectrum of **SFX-2SP**.



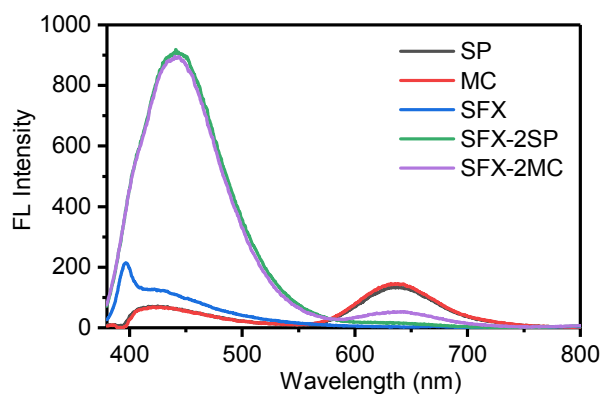


Figure S10. UV-vis and emission spectra of **SPF**, **SP**, **SFX-2SP** and **SFX-2MC** in EtOH.

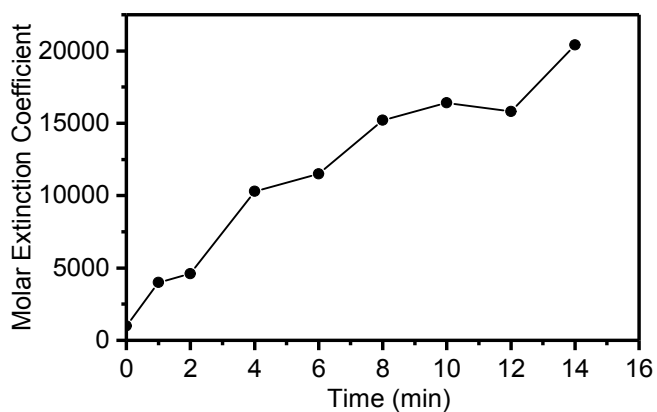


Figure S11 The molar extinction coefficient at 557 nm for **SPF-2SP** in EtOH with different 365 nm irradiation time.

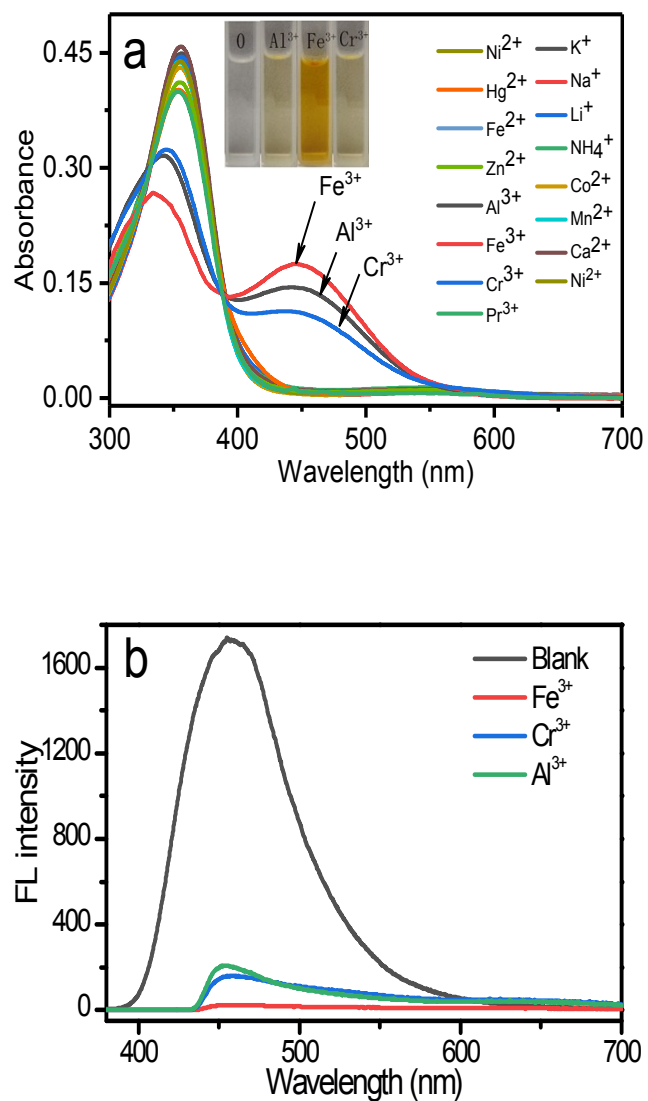


Figure S12(a) The absorption and (b) PL spectra of **SFX-2SP** (6 μM) in EtOH-H₂O (9:1, v/v) with different metal ions (1mM). Insets: The pictures of corresponding solutions in ambient light.

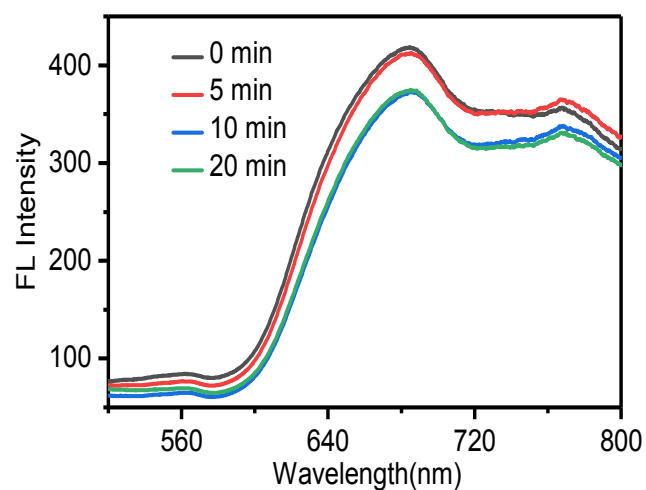


Figure S13 The PL spectra of **SFX-2SP** solid with different 365 nm irradiation time.

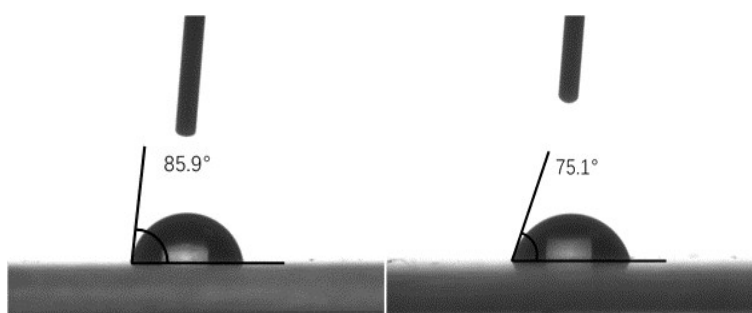


Figure S14 Contact angle of the surface of the **SFX-2SP** film (a) before and (b) after UV light irradiation.

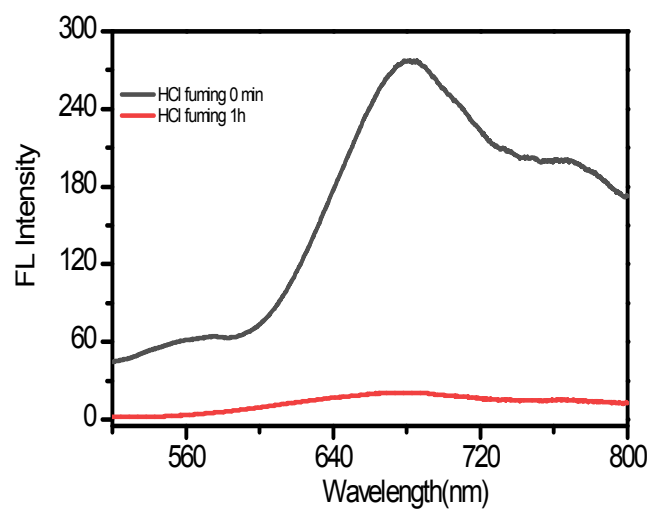


Figure S15 The PL spectra of **SFX-2SP** solid with HCl fuming.

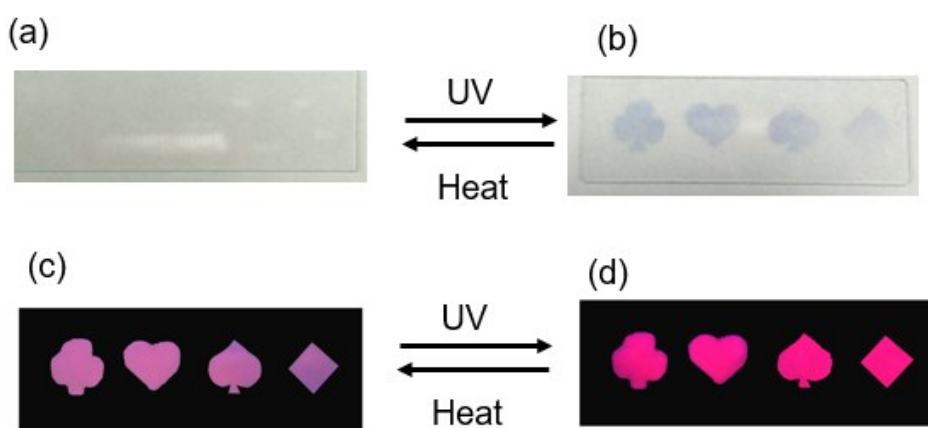


Figure S16 Application of information encryption and decryption with 1 wt% **SFX-2SP**-loaded PMMA film by UV irradiation and heat.

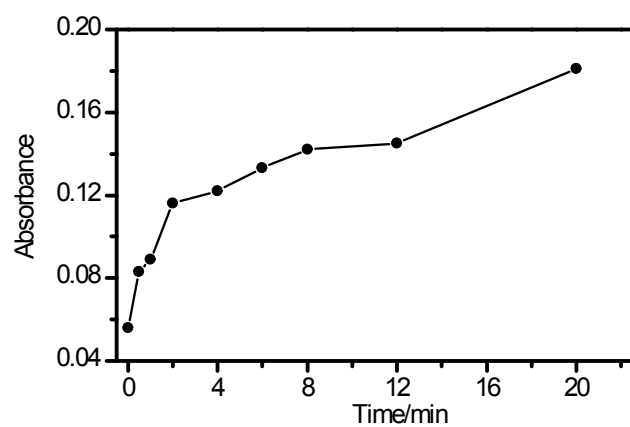


Figure S17 The molar extinction coefficient of **SPF-2SP** in PMMA -based film with different 365 nm irradiation time.

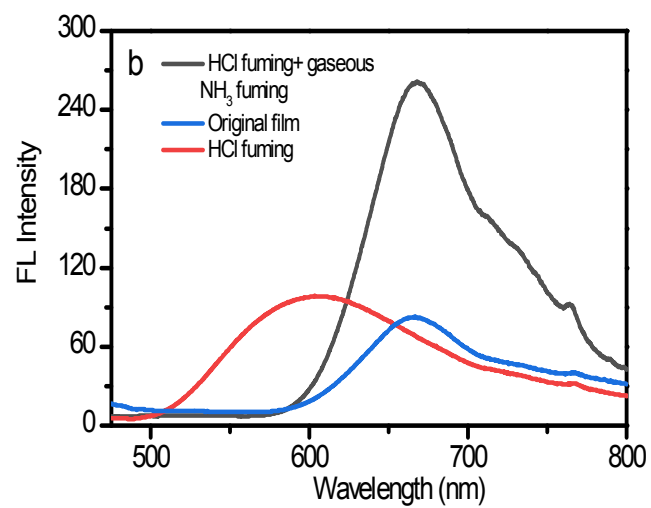
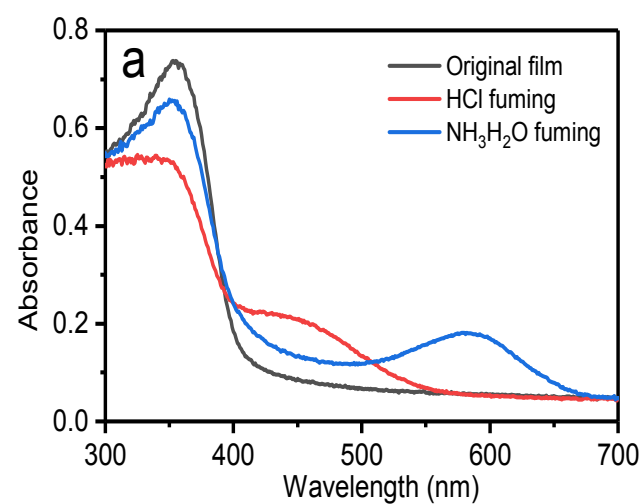


Figure S18 (a) UV-vis and (b) emission spectra of 1 wt% **SFX-2SP**-loaded PMMA film upon HCl and gaseous NH_3 fuming.

Table S1 The absolute quantum yield of solution in EtOH with increasing irradiation time.

Entry	Irradiation time (min)	Absolute quantum yield
1	0	0.07
2	4	0.11
3	8	0.10

Table S2 The absolute quantum yield of 1 wt% **SFX-2SP**-loaded PMMA film with increasing irradiation time.

Entry	Irradiation time (min)	Absolute quantum yield
1	0	0.04
2	2	0.14
3	4	0.16
4	6	0.17
5	10	0.16
6	20	0.15

Table S3 The fluorescence lifetime of 1 wt% **SFX-2SP**-loaded PMMA film with increasing irradiation time.

Entry	Irradiation time (min)	fluorescence lifetime (ns)
1	0	2.568
2	0.5	2.235
3	1	2.206
4	2	2.116
5	4	2.099
6	6	2.090
7	8	2.102
8	12	2.104
9	16	2.097
10	20	2.133

Table S4 The fluorescence lifetime of **SFX-2SP** solution in EtOH with increasing irradiation time.

Entry	Irradiation time (min)	fluorescence lifetime (ns)
1	0	4.099
2	1	3.592
3	2	3.476
4	4	2.255