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Supporting information

A colorimetric and fluorescent sensor to both fluoride ion and

trifluoroacetic acid based on acylhydrazone derivative

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Fig. S1 SEM images of (a) PAH-8 xerogel (6mg/mL) from DMSO and (b) the cast film after addition of TBAF into organogel.



Fig. S2 Photographs of PAH-8 in DMSO solution (8×10^{-5} mol/L) upon addition of various anions (21 equiv. F⁻, Cl⁻, Br⁻, AcO⁻, H₂PO₄⁻).



Fig. S3. Absorbance spectra changes of PAH-8 (8×10^{-5} mol/L) upon the addition of 0–21 equiv. F⁻ in DMSO.



Fig. S4 Job's plot showing 1:1 complex formation between compound PAH-8 and F⁻.



Fig. S5 Benesi-Hildebrand plot for compound PAH-8 in the presence of fluoride (Absorption was monitored at 464 nm, A_{max} =2.40, A_{min} =0.0077).



Fig. S6 UV-vis absorption spectra of PAH-8 (5×10⁻⁵ mol/L) in DMSO titrated with F⁻.



Fig. S7 The calibration curve of absorption intensities at 377 nm (R=0.982).

No.	1	2	3	4	5	6	7	8	9	10
Int.	2.06 06	2.05 89	2.06 13	2.06 21	2.08 13	2.08 58	2.08 56	2.08 64	2.08 68	2.08 72
No.	11	12	13	14	15	16	17	18	19	20
1,01			-0			10	- /	10		20

2.08

94

Table1. The absorption intensities of 20 blank solutions at 377 nm.

2.08

96

Int.

2.08

72

2.08

74

2.08

72

Based	on	the	definition	by	IUPAC	(CDL	=	3σ/k)	from	20	blank	solutions,	the
detection limit of PAH-8 for F^- was estimated to be 0.831 μ M.													

2.08

88

2.08

92

2.09

16

2.09

08

2.09

14



Fig. S8 Plots of ¹H NMR spectra of PAH-8 $(3 \times 10^{-3} \text{mol/L})$ in the absence and presence of 10 equiv. F⁻ in DMSO-*d6*.



Fig. S9. The changes in the DMSO gel (6 mg/ mL) after addition of solid TBAF (21 equiv). The red solution could re-gelate after addition of ethanol.



Fig. S10 Cyclic graph of fluorescence on/off in Fig. 4.



Fig. S11 Photographs of the cast film (the solution from the PAH-8 DMSO gel upon the addition of TBAF) onto glass surface in the (a) air and (b) argon-protected container.



Fig. S12 (a) Fluorescence emission of xerogel in different concentrations of TFA atmospheres; (b) the curve of the fluorescence emission intensity at 461nm versus

different concentrations of TFA.



Fig. S13 (a, c) Fluorescence emission and (b, d) UV-vis absorption spectra of PAH-8 in chloroform with the addition of different acids and amines (same equiv.).



Fig. S14 UV-vis absorption spectral changes of PAH-8 in chloroform (5×10^{-5} mol/L) upon addition of TFA.



Fig. S15. The UV-vis absorption spectra of PAH-8 (a) xerogel film, (b) the xerogel film fumed by TFA, (c) fumed by TEA based on (b) at room temperature, and (d) standing at room temperature for a few minutes after fumed by TFA (the sample is casting on quartz wafers for testing).



Fig. S16. Partial ¹H NMR spectra of PAH-8 following addition of TFA-*d* (0-30 eq.) in CDCl₃-*d*.



Fig. S17 XRD patterns of PAH-8 (a) xerogel, (b) xerogel stimulated by TFA vapors, (c) stimulated by TEA vapors based on (b), (d) and further stimulated by TFA vapors based on (c).



Fig. S18 SEM images of (a) PAH-8 xerogel (6mg/mL) from DMSO and (b) xerogel stimulated by TFA vapors and (c) then stimulated by TEA vapors based on (b).



Fig. S19. Photographic images of information encryption and decryption under daylight.