

Electronic Supplementary Information (ESI)

**Fluorescence-Switchable Luminogen in Solid State: A
Sensitive and Selective Sensor for the Fast “Turn-On”
Detection of Primary Amine Gas**

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Experimental section

Materials and Instrumentations

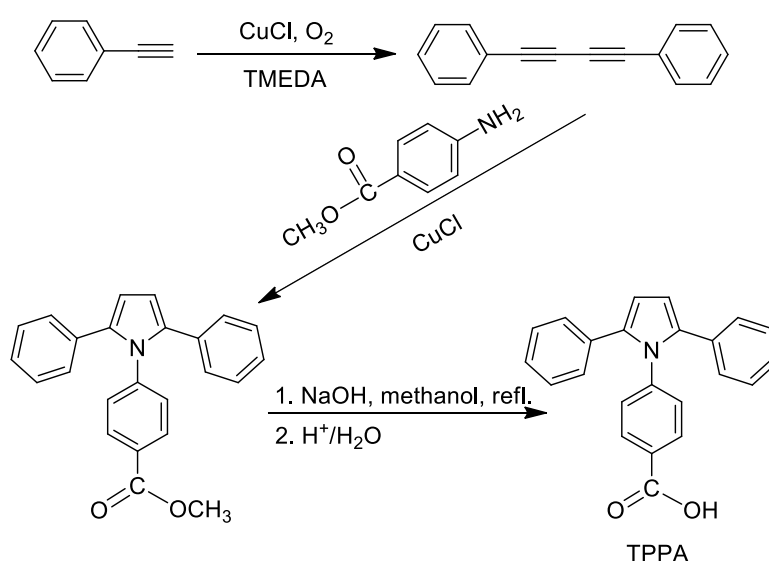
Tetrahydrofuran (THF) and ethanol were distilled from sodium benzophenone ketyl and magnesium, respectively, under nitrogen immediately prior to use. Other chemicals were purchased from Aldrich and Alfa Aesar and used as received without further purification. ¹H spectra were measured on a Bruker AV 400 spectrometer in dimethylsulfoxide (DMSO) using tetramethylsilane (TMS; $\delta = 0$) as internal reference.

High resolution mass spectra (HRMS) were recorded on a GCT premier CAB048 mass spectrometer operated in MALDI-TOF mode. UV spectra were measured on a Milton Roy Spectronic 3000 Array spectrophotometer. Photoluminescence (PL) spectra were recorded on a Perkin-Elmer LS 55 spectrofluorometer. The PL quantum yields (Φ_F) of TPPA in THF and THF/water mixtures were determined using quinine sulfate (Φ_{FL} = 54% in 0.1 M sulfuric acid solution) as standard. The morphologies of the nanofibres of TPPA were investigated using JOEL 2010 Transmission Electron Microscopy (TEM). Powder X-ray diffraction (XRD) patterns were recorded on an X'pert PRO, PANalytical diffractometer. The ground-state geometries were optimized using the density functional (DFT) with B3LYP hybrid functional at the basis set level of 6-31G. All the calculations were performed using Gaussian 03 package.

Synthesis

4-(2,5-diphenyl-1-pyrrolyl)benzoic acid (TPPA) was prepared according to the synthetic route shown in Scheme S1. Details can be found in our previous publications.^{1,2} Its ¹HNMR and mass data are given below.

¹H NMR (400 MHz, DMSO-*d*₆), δ (TMS, ppm): 13.15 (s, 1H), 7.86–7.84 (d, *J* = 8.4 Hz), 7.24–7.16 (m, 8H), 7.05–7.03 (d, *J* = 7.2 Hz), 6.51 (s, 2H). HRMS (MALDI-TOF): *m/z* 339.1255 [*M*⁺, calcd 339.1259].



Scheme S1 Synthetic route to TPPA

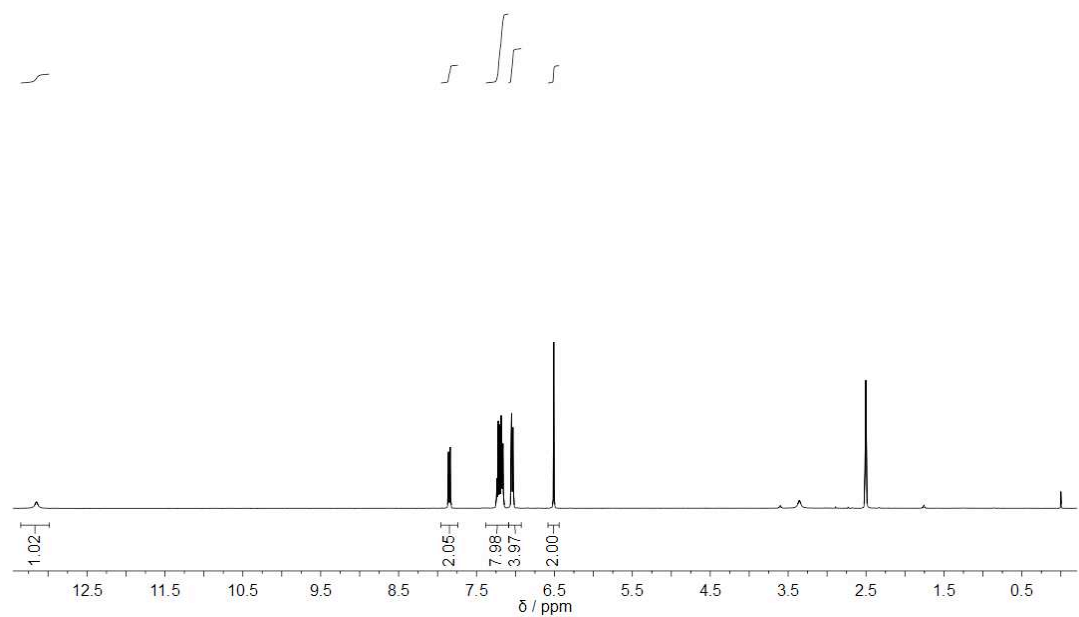


Fig. S1 ^1H NMR spectrum of TPPA.

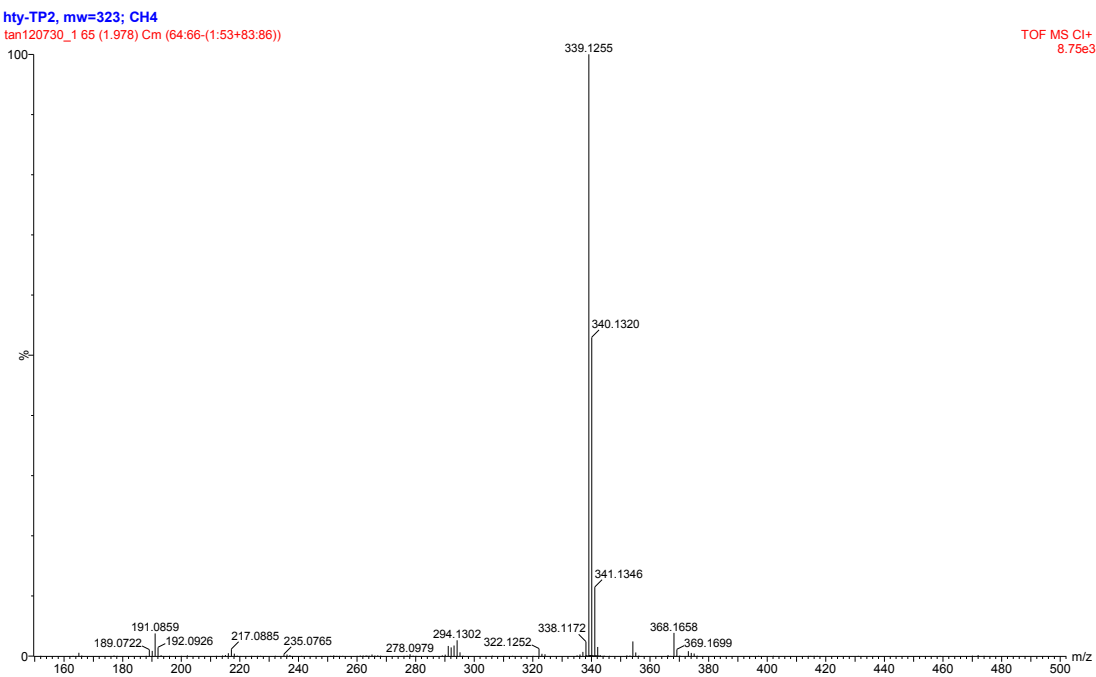


Fig. S2 MALDI-TOF mass spectrum of TPPA.

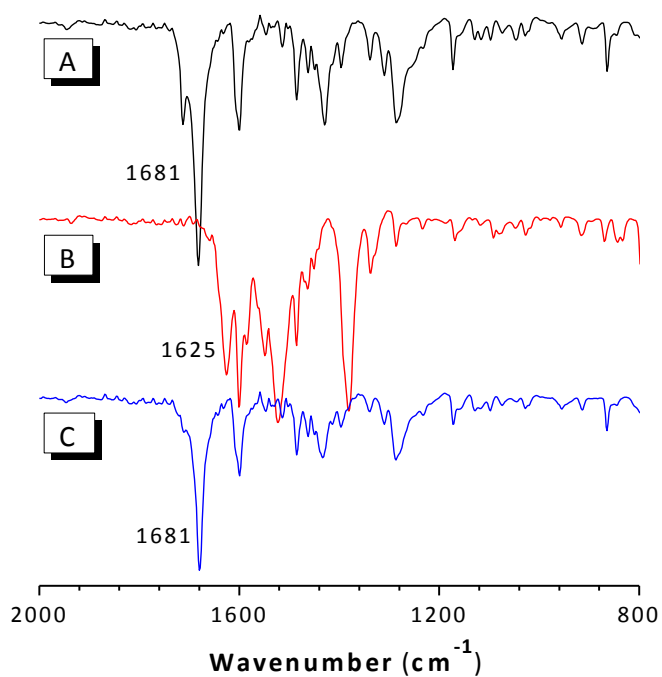


Fig. S3 IR spectra of TPPA films (A) before and (B and C) after fumed with (B) butylamine and (C) triethylamine gas.

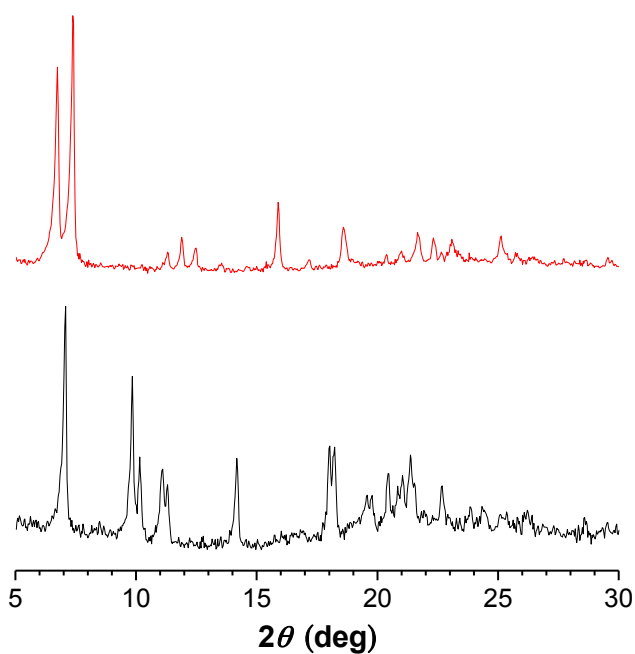


Fig. S4 X-ray diffractograms of TPPA drop-casting films (red) before and (black) after exposed to butylamine gas.

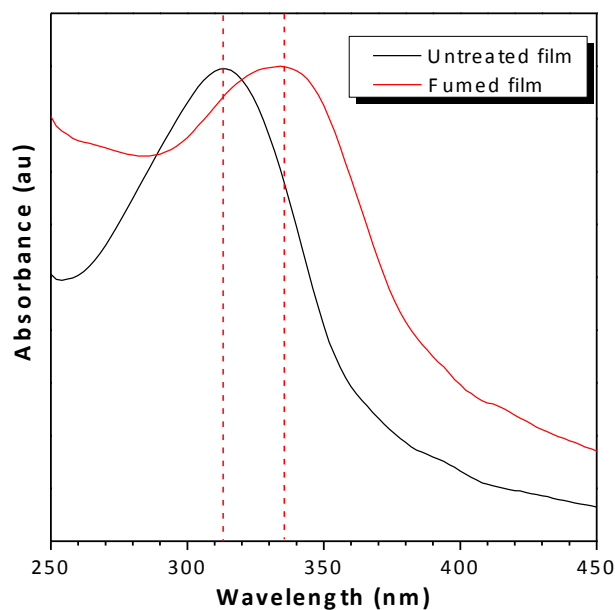


Fig. S5 Absorption spectra of TPPA films before (black) and after (red) fumed by butylamine gas.

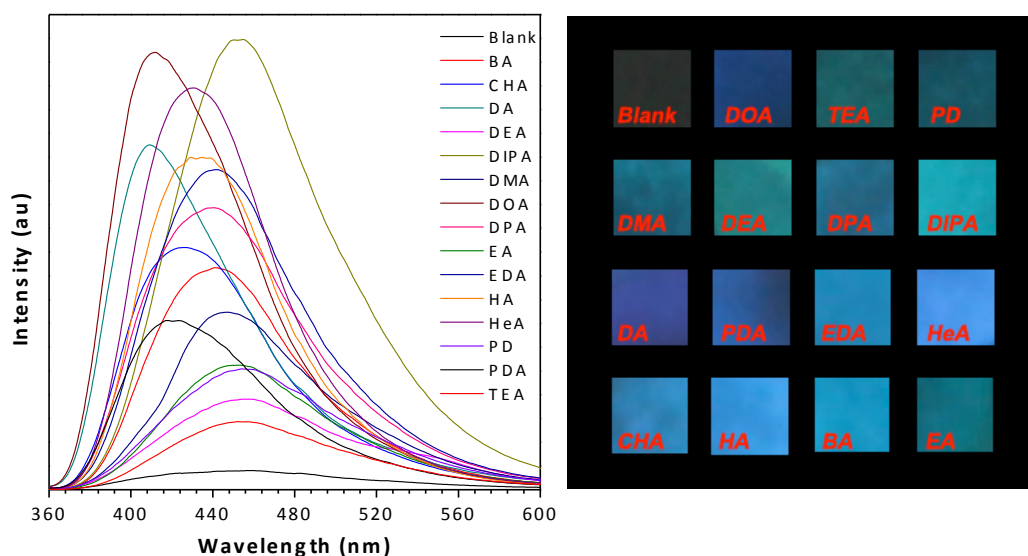


Fig. S6 Fluorescent photos and emission spectra of TPPA-loaded filter paper strips after dipped into different amines. Abbreviation: ethylamine (EA), butylamine (BA), hexylamine (HA), cyclohexylamine (CHA), heptylamine (HeA), ethylenediamine (EDA), propanediamine (PDA), pyridine (PD), dimethylamine (DMA), diethylamine (DEA), dipropylamine (DPA), *N,N*-diisopropylamine (DIPA), decylamine (DA), di-*n*-octylamine (DOA) and triethylamine (TEA). Excitation wavelength: 350 nm. The photos were taken under 365 nm UV irradiation from a hand-held UV lamp.

References

- 1 X. Feng, B. Tong, J. B. Shen, J. B. Shi, T. Y. Han, L. Chen, J. G. Zhi, P. Lu, Y. G. Ma and Y. P. Dong, *J. Phys. Chem. B*, 2010, **114**, 16731.
- 2 T. Y. Han, X. Feng, B. Tong, J. B. Shi, L. Chen, J. G. Zhi and Y. P. Dong, *Chem. Commun.*, 2012, **48**, 416.