Electronic Supplementary Information

Fluorescence sensor using porous host molecules deposited on filter paper with vapochromic and mechanochromic properties

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Experimental Procedures

Materials

Compounds **1** and **2** were synthesized using methods described in previous papers.[12,27]

Preparation of 1- and 2-adsorbed papers

Chloroform solutions of **1** (0.5 mM, 10 μL) and **2** (2.5 mM, 10 μL) were dropped on the paper filters (21 mm in diameter; Kiriyama Glass Works Co., Tokyo, Japan) and dried at ambient temperature.

Preparation of 1- and 2-adsorbed papers exposed to vapors of small aromatic guests

The **1**- and **2**-adsorbed papers and small Petri dish (30-mm diameter) with small aromatic guests were placed in a glass Petri dish (90-mm diameter) with a lid.

UV–vis diffuse reflectance and fluorescence emission measurements

UV–vis diffuse reflectance measurements were recorded using a JASCO V-670 spectrometer (JASCO Corp., Tokyo, Japan) with an integrating sphere attachment. Fluorescence excitation and emission spectra were collected at 25 °C on a Hitachi F-7000 fluorescence spectrometer (Hitachi Ltd., Tokyo, Japan). Emission spectra were collected between 385 and 800 nm, with a scan speed of 240 nm/min, and the slits were set at 5.0 nm (excitation slit) and 5.0 nm (emission slit). The excitation wavelength was 370 nm.

Wide-angle X-ray scattering (WAXS)

WAXS measurements were performed at BL40B2 of SPring-8, Japan. A 7.73 × 3.86 cm^2 photon-counting detector (EIGER 2 S) was placed 0.098 m away from the sample. The wavelength (λ) of the incident beam was 1 Å. These setups provided a q range of 2–30 nm^{-1}, where q is the magnitude of the scattering vector defined by $q = 4\pi\sin\theta/\lambda$ with a scattering angle of 2θ. WAXS spectra were measured at 25 °C, with an exposure time of 180 s. The resulting 2D WAXS images were converted to 1D $I(q)$ versus q profiles by circular averaging with the software package FIT2D.

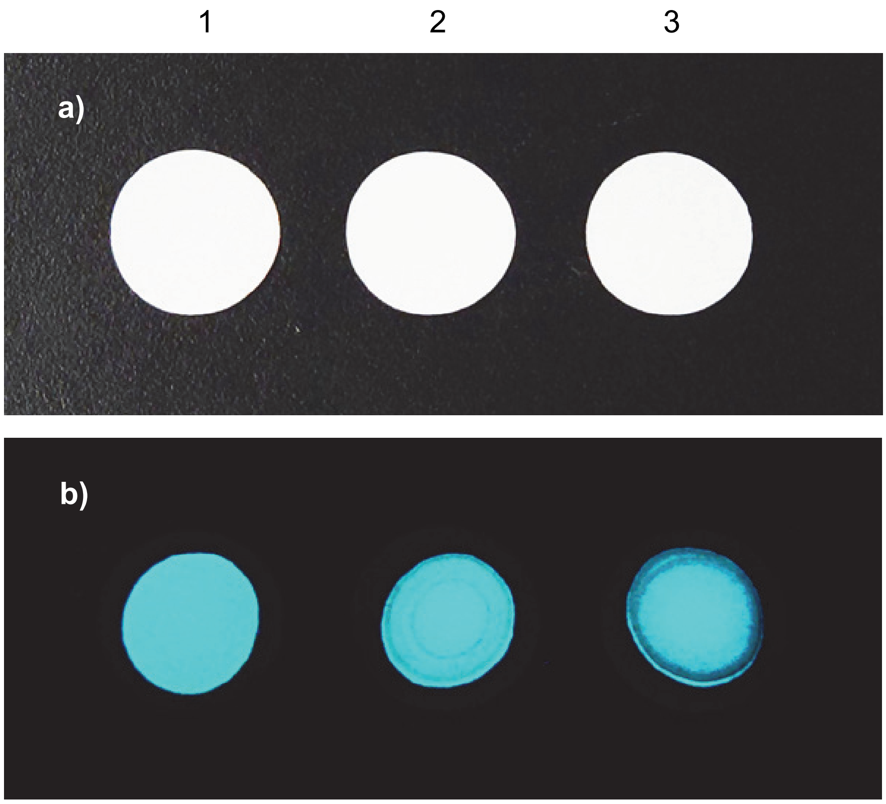

Fig. S1 Photographs of a paper filter under a) daylight and b) a UV lamp (365 nm). The **2**-adsorbed papers were prepared by one cycle (Sample 1), two cycles (Sample 2), and three cycles (Sample 3) of dropping the chloroform solution of **2** (10 μL, [**2**] = 2.5 mM) and drying. The paper filters were exposed to toluene vapor for 1 h (paper filters' diameter: 21 mm).

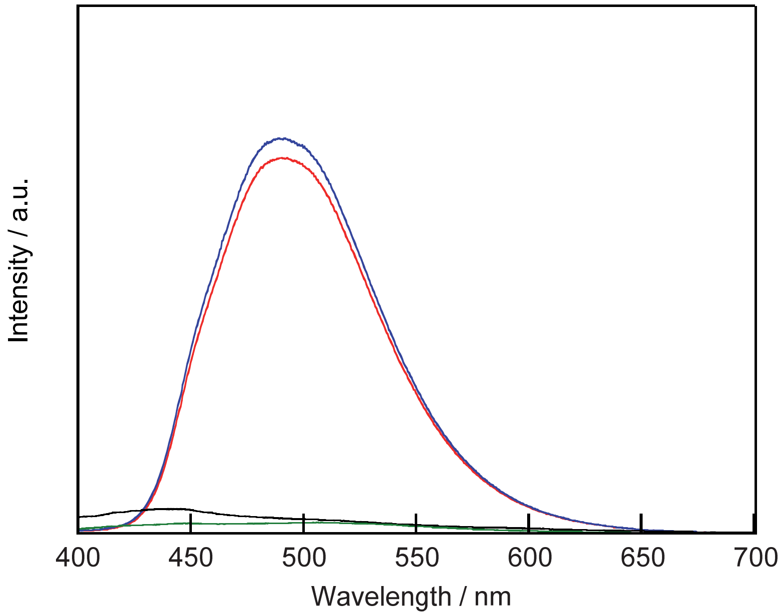

Fig. S2 Emission spectra of a filter paper without the adsorption of **2** (black), the **2**-adsorbed papers (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM) after the exposure of chloroform vapor (green), toluene vapor (blue) and toluene-hexane vapor (red) for 1 h. Excitation at 370 nm.

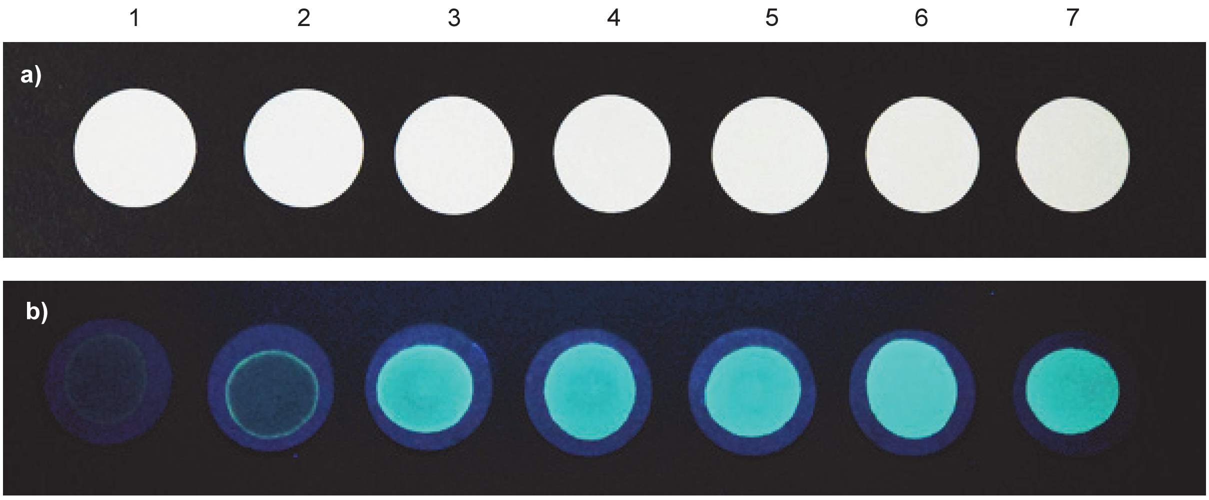

Fig. S3 Photographs of a paper filter under a) daylight and b) a UV lamp (365 nm). Samples 1–7 of the **2**-adsorbed papers (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM) were exposed to toluene vapor for 0, 10, 20, 30, 40, 60, and 120 min, respectively (paper filters' diameter: 21 mm).

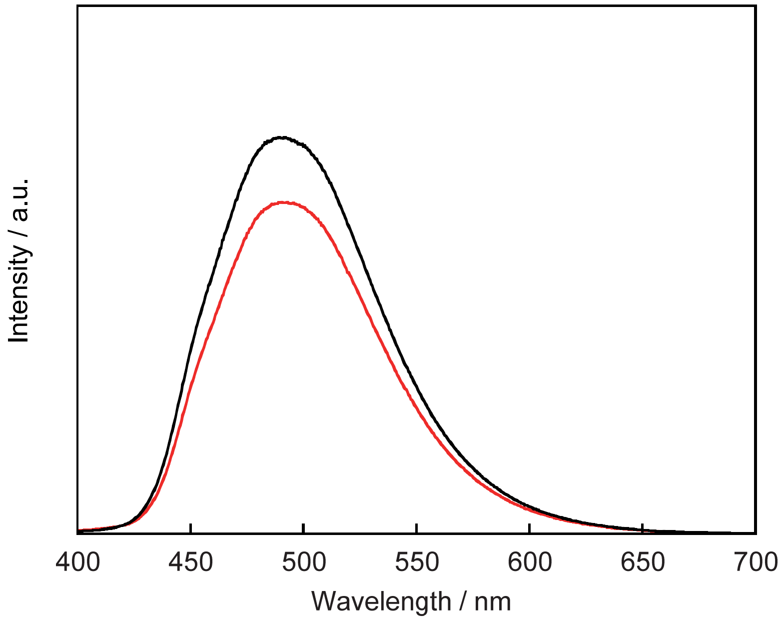

Fig. S4 Emission spectra of the **2**-dropped papers (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM) prepared for one week ago (red) and prepared immediately before use (black) after the exposure of toluene vapor for 1 h. Excitation at 370 nm.

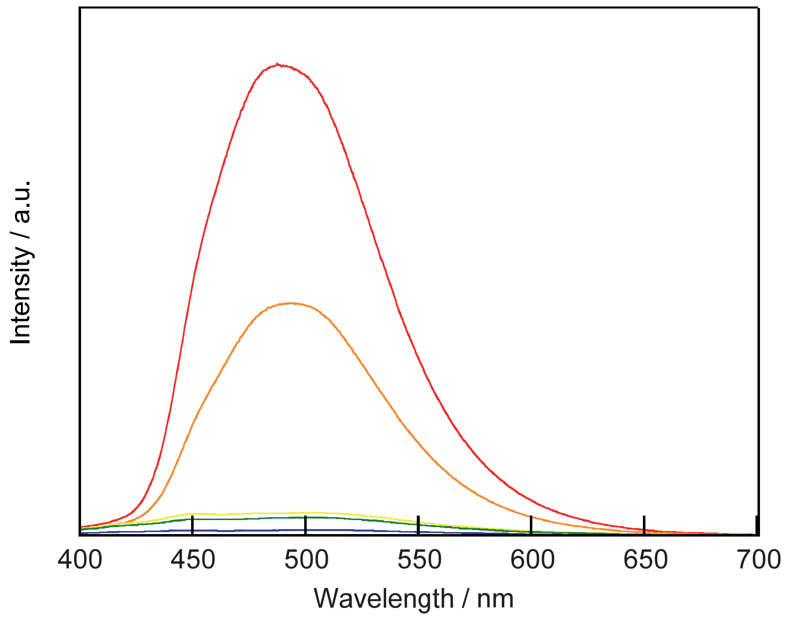

Fig. S5 Emission spectra of the **2**-adsorbed papers (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM) before (blue) and after 24 h of exposure to toluene vapor of 20 (green), 50 (yellow), 100 (orange), and 200 (red) ppm. Excitation at 370 nm.

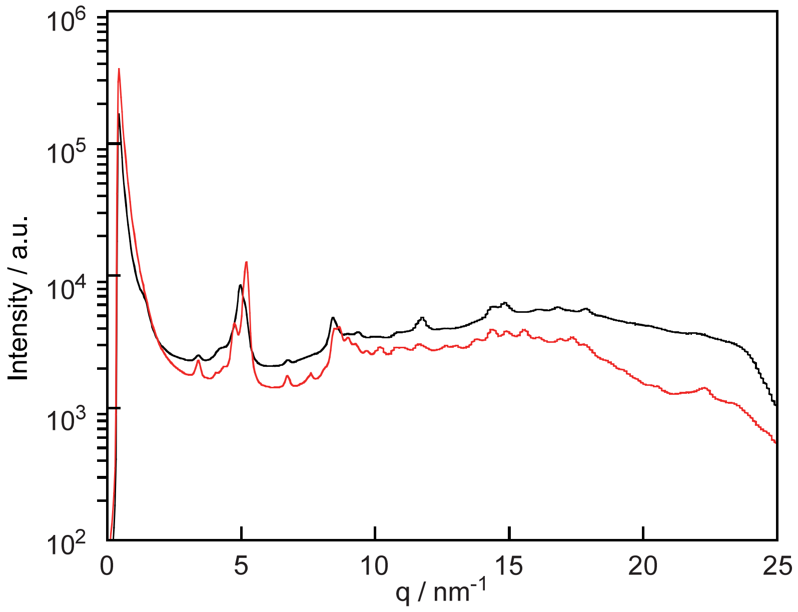

Fig. S6 1D WAXS intensity profiles of **2** dried from chloroform solutions before (black) and after (red) complexes upon exposure to toluene vapor.

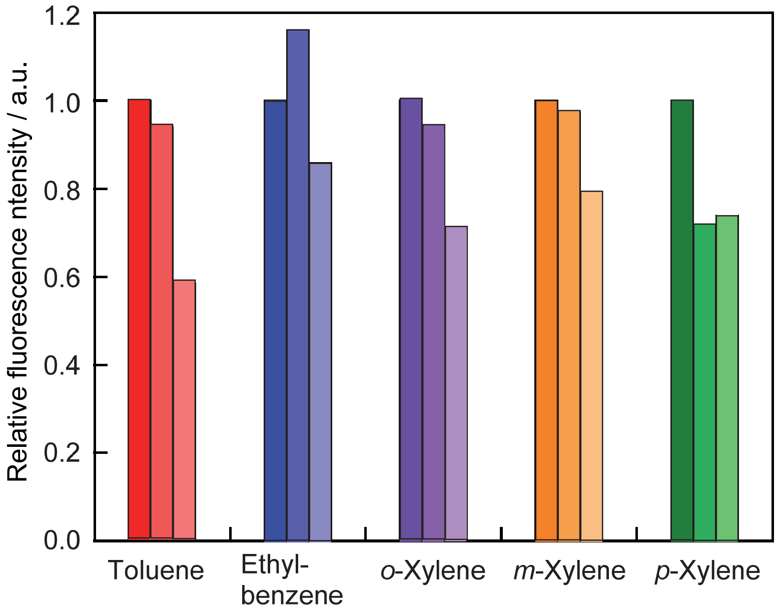

Fig. S7 Relative fluorescence intensity of the **2**-toluene-adsorbed (red), **2**-ethylbenzene-adsorbed (blue), **2**-*o*-xylene-adsorbed (purple), **2**-*m*-xylene-adsorbed (red), and **2**-*p*-xylene-adsorbed (green) papers after incubation for 0 (left), 15 (center), and 30 (right) days (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM). Excitation at 370 nm.

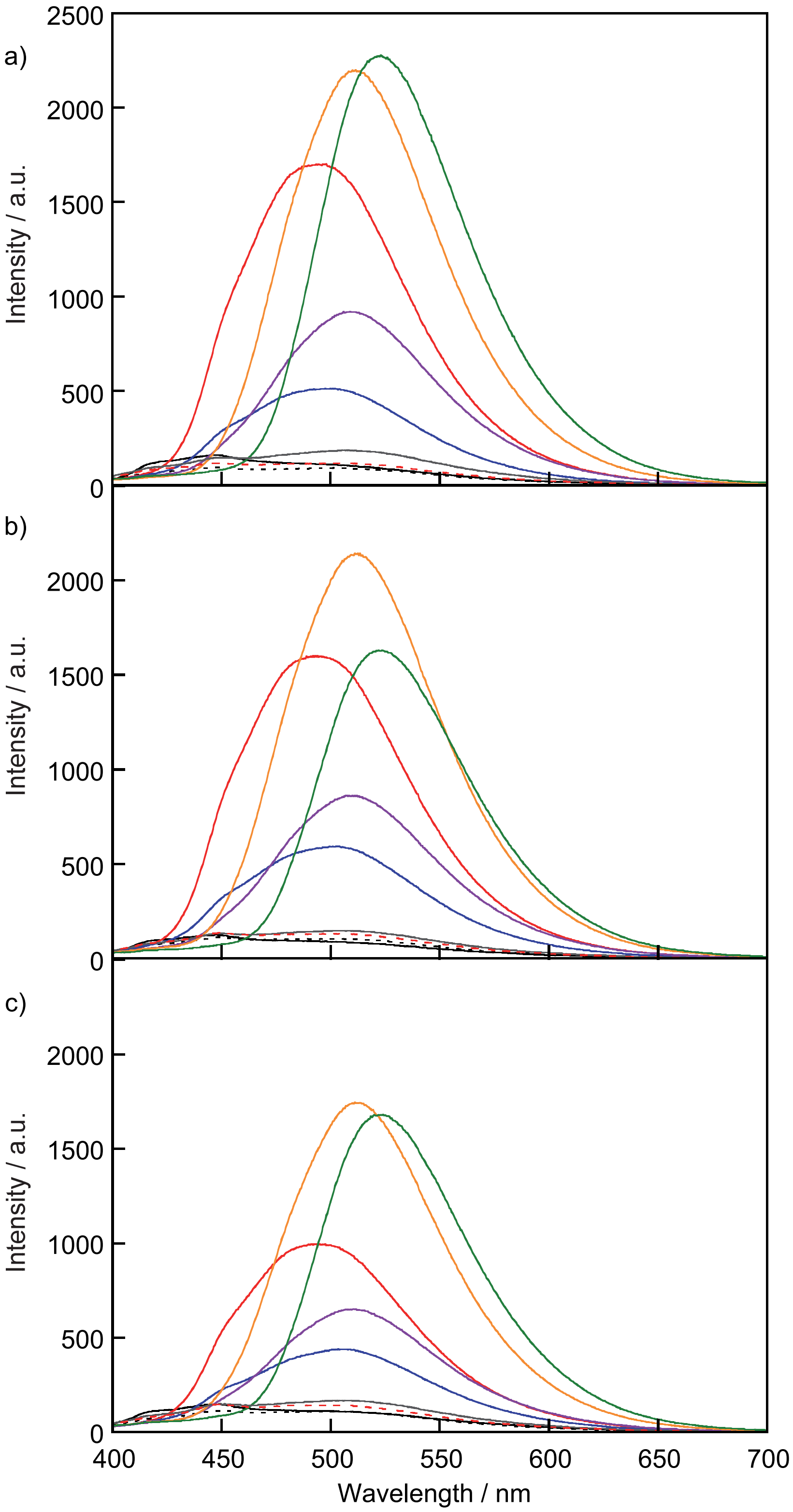

Fig. S8 Emission spectra of **2** dropped on paper filters (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM) before (black dashed line) and after exposure to vapors of benzene (black), toluene (red), ethylbenzene (blue), *o*-xylene (purple), *m*-xylene (orange), *p*-xylene (green), 1,3,5-trimethylbenzene (gray), and hexane (red dashed line) after incubation for (a) 0, (b) 15, and (c) 30 days. Excitation at 370 nm.

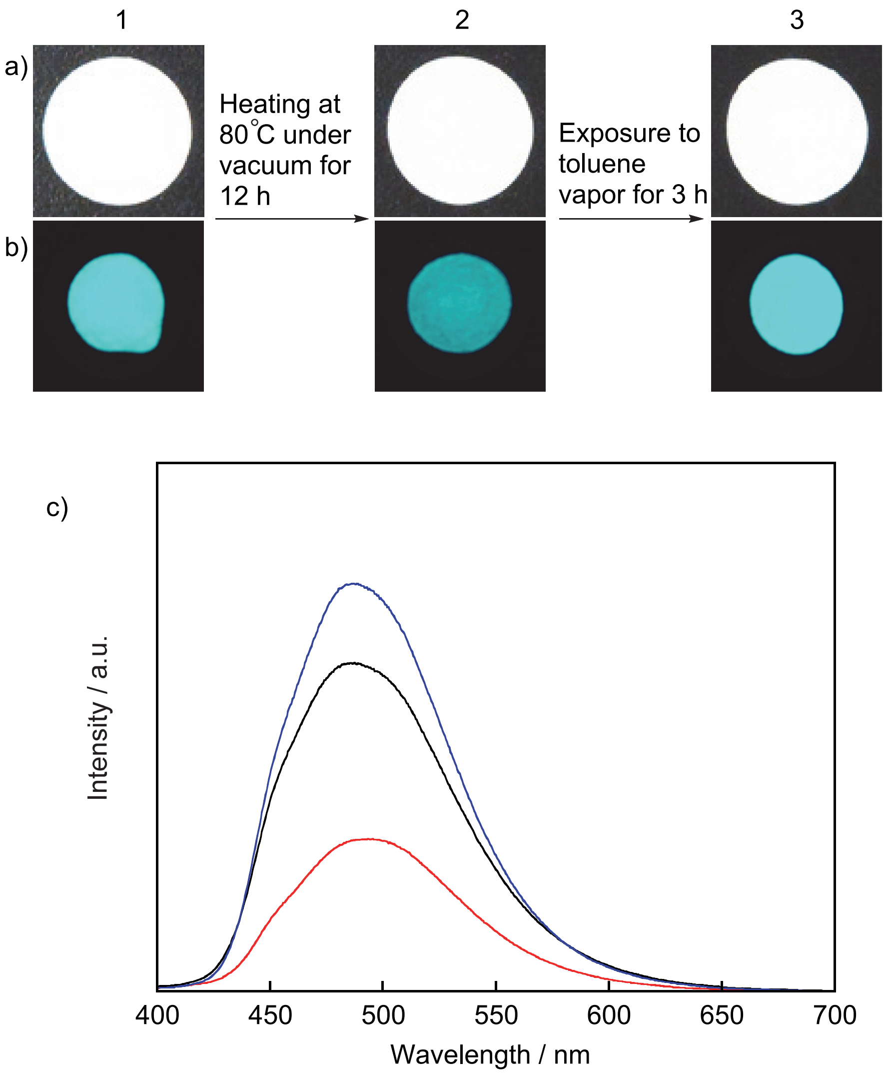

Fig. S9 Photographs of a paper filter under a) daylight and b) a UV lamp (365 nm). The **2**-toluene-dropped paper (dropping of the chloroform solution **2** and drying; 10 μL, [**2**] = 2.5 mM: exposure of toluene vapor for 1 h) was before (sample 1) and after heating at 80 °C under vacuum for 12 h (sample 2) and then after the exposure of toluene vapor for 3 h (sample 3) (paper filters' diameter: 21 mm). c) Emission spectra of the **2**-toluene-dropped paper before (black) and after heating at 80 °C under vacuum for 12 h (red) and then after the exposure of toluene vapor for 3 h (blue). Excitation at 370 nm.

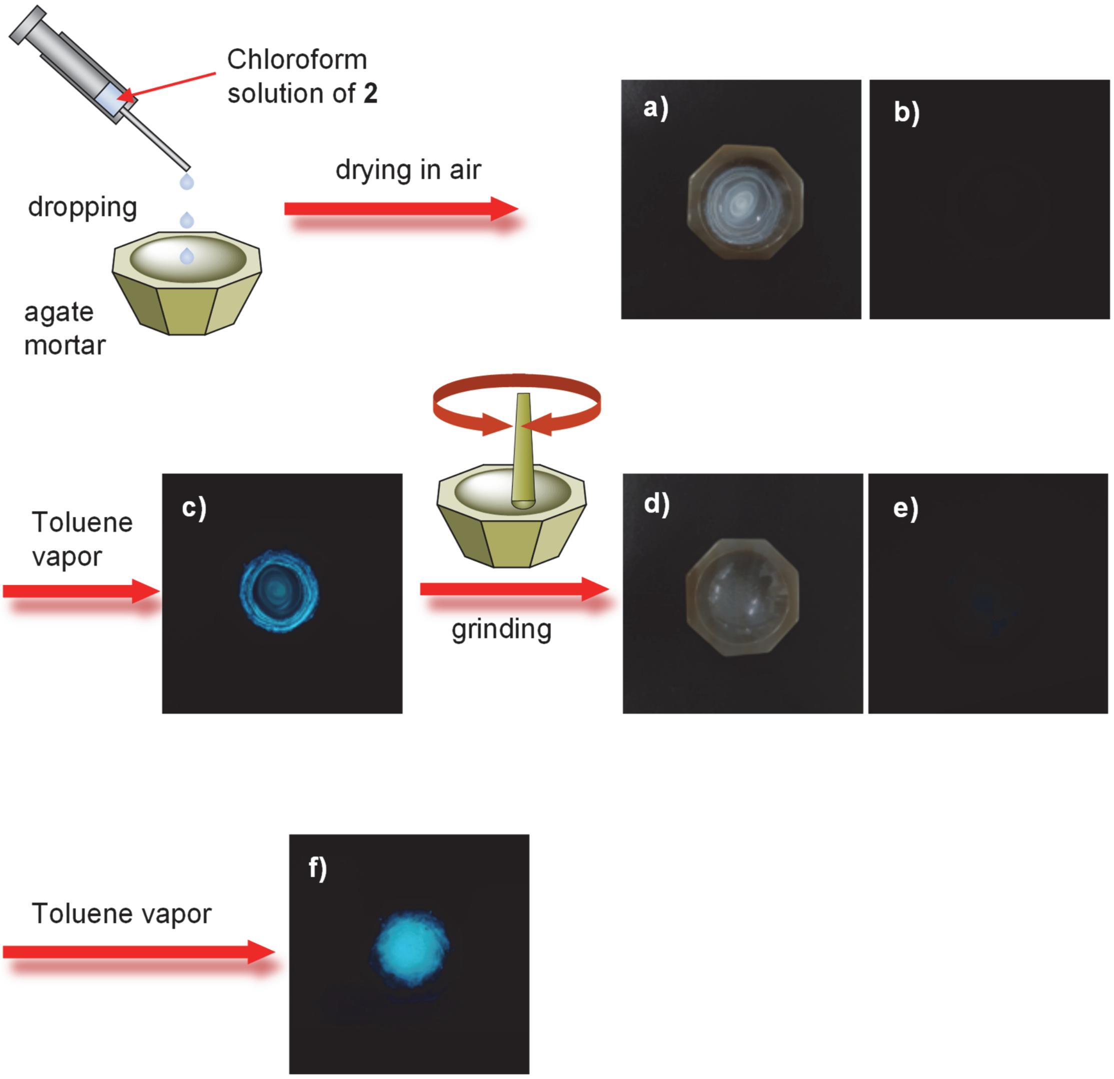

Fig. S10 Photographs of **2** on the agate mortar under (a) and (c) daylight and (b), (c), (e), and (f) a UV lamp (365 nm). Compound **2** dried from chloroform solution on the agate mortar was exposed to toluene vapor for 1 h. The solid of **2** was grinded and exposed to toluene vapor for 1 h again.