ESI for the following manuscript:

A Fluorescent Turn-on Low Dose Detection of Gamma-Ray Radiation Based on Aggregation-Induced Emission

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1. General information for synthesis and characterization

General. Melting points were measured with Büchi B-540. ¹H NMR and ¹³C NMR spectra were recorded on Bruker Avance 400 MHz spectrometer. Fluorescence spectra were studied on a Hitachi FP-6000 spectrometer. UV/Vis absorption spectra were recorded on Jasco V-570 spectrophotometer. Dynamic light scattering (DLS) experiments were carried out with Malvern Instrument (Nano Series). Confocal fluorescence imaging experiments were performed with an Olympus FV-1000 laser scanning microscopy system, based on an IX81 (Olympus, Japan) inverted microscope.

Scanning electron micrographs were taken with Hitachi S-4800 microscopy equipped with a digital camera. The samples were prepared as follows: 1) a carbon coated TEM grid was placed on a filter paper. 2) 300 μ L solution of 1 in CHCl₃ before and after addition of HCl/gamma-radiation were dropped onto the carbon coated TEM grids; the solvents were absorbed by the filter papers quickly. Thus, these procedures could avoid the formation of aggregates due to evaporation of solvents during the sample preparation. 3) then, the samples were spluttered with platinum for further measurements.

Samples radiations were carried out with Co60 γ radiation facility at Beijing Radiation Application Research Centre. The dosages of gamma-radiations were verified with Alanine Dosimeters (dose range: 1 Gy-200 kGy).

Materials. All reagents and solvents were obtained from commercial suppliers. $CHCl_3$ and CH_2Cl_2 were purified as follows: $CHCl_3$ (300 mL) was washed with deionized water (300 mL) to remove EtOH and HCl, followed dried by with anhydrous MgSO₄. After refluxing with P_2O_5 , the CHCl₃ was collected by distillation. CH_2Cl_2 was refluxed with CaH₂ and collected by distillation. The purified CHCl₃ and CH₂Cl₂ was sealed and stored in the dark. Compound **2** was prepared according to reported procedures.^{S1}

2. Synthesis of compound 1



Scheme S1 Synthetic approach to compound 1

Synthesis of compound 1: A mixture of compound 2 (360.1 mg, 1.0 mmol), compound 3 (190.8 mg, 1.2 mmol) in ethanol (20 mL) were refluxed for 12 hours under nitrogen. After cooling to room temperature, the solvent was evaporated under reduced pressure. The residue was dissolved in CH_2Cl_2 and the organic phase was washed with water for three times. The organic layer was dried with anhydrous MgSO₄, filtered and

evaporated. The residue was subjected to column chromatography with CH₂Cl₂/PE (petroleum ether) (v/v, 2/1) as eluant. Compound **1** was obtained as yellow solid (436.5 mg, 0.87 mmol) in 87.1% yield. Mp: 94.1-95.2°C. ¹H NMR (400 MHz DMSO- d_6): δ 7.63 (1H, d, J = 16.0 Hz), 7.56 (2H, d, J = 8.0 Hz), 7.50 (1H, d, J = 8.0 Hz), 7.45 (1H, d, J = 8.0 Hz), 7.32-7.28 (1H, m), 7.23-7.11 (11H, m), 7.03-7.01 (8H, m), 1.38(6H, s). ¹³C NMR (100 MHz, DMSO- d_6): δ 188.29, 158.93, 151.98, 149.56, 148.33, 148.29, 148.16, 146.36, 145.32, 142.15, 139.26, 136.42, 135.96, 135.91, 135.87,133.20, 133.12, 133.04, 132.82, 132.47, 132.02, 131.91, 131.86, 130.63, 126.72, 125.24, 125.02, 57.5, 28.14. HR-MS (ESI):calcd. for C₃₈H₃₁NNa (M⁺+Na⁺): 524.2350; Found: 524.2349.

Reference:

S1: X. Zhang, Z. Chi, H. Li, B. Xu, X. Li, W. Zhou, S. Liu, Y. Zhang, J. Xu, *Chem. Asian J.*, 2011, **6**, 808.

3. Fluorescence and absorption spectra of 1 in the presence different amounts of acids



Fig. S1 Fluorescence ($\lambda_{ex} = 460 \text{ nm}$) and absorption spectra of the CHCl₃ solutions of 1 (10.0 μ M)

in the presence of different amounts of acids: trifluoroacetic acid (A and B); trifluoromethanesulfonic acid (C and D) and acetic acid (E and F).



4. Fluorescent images of 1 before and after addition of HCl

Fig. S2. a) Bright field and b) fluorescent images of compound 1 (50.0 μ M) before addition of HCl; c) Bright field and d) fluorescent images of compound 1 (50.0 μ M) after addition of 100 μ M HCl. The scale bar represents 5.0 μ m.

5. SEM images of 1 before and after addition of HCl or gamma-ray radiation



Fig. S3 SEM images of 1 (10 μ M, 3 mL) before (A) and after addition of HCl (35 μ M, B), gamma-radiation (9.0 Gy, C).

6. DLS profiles of compound 1 before and after addition of HCl or gamma-ray radiation.



Fig. S4 a) DLS profiles of the solution of compound **1** (10.0 μ M) before (black) and after the addition of HCl (35 μ M, red); b) DLS profiles of the solution of compound **1** (3 mL, 10.0 μ M) before (black) and after irradiated by gamma-ray radiation (dosage = 8.0 Gy) (red).



7. Absorption and fluorescence spectra of 1 in CHCl₃ after gamma-ray radiation

Fig. S5. Absorption spectra of the CHCl₃ solution of compound **1** (3 mL, 10 μ M) recorded under increasing dosages of gamma-ray radiation up to 9.0 Gy (**A**) and Fluorescence spectra of CHCl₃ solutions of **1** (**B: 10** μ M; **C: 5** μ M; **D: 20** μ M) after increasing dosages of gamma-radiation up to 20.0 Gy; C: plots of the fluorescence intensity of **1** of different concentrations (5, 10 and 20 μ M) in CHCl₃ at 640 nm *vs.* the dosage of gamma-ray radiation. The volume of each solution is 3 mL.

8. ¹H NMR and ¹³C NMR spectra of 1







