Supporting Information

A Facile and Convenient Fluorescence Detection of Gamma-ray Radiation Based on the Aggregation-Induced Emission

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Contents

General Experimental

Materials. All reagents and solvents were obtained from commercial suppliers (Alfa Aesar, Aldrich) and were used without further purification unless otherwise indicated. Air- and moisture-sensitive reactions were conducted in oven-dried glassware using standard Schlenk line. The pure water used was purified by a Millipore filtration system.

Instrument. The ^{1}H and ^{13}C NMR spectra were recorded on a BRUKER Model ADVANCE DPX 300 spectrometer (300 MHz ^{1}H and 75 MHz ^{13}C) using tetramethylsilane as an internal standard. All signals are reported in parts per million units (ppm). TGA and DSC measurements were performed under nitrogen atmosphere at a heating rate of 10 °C/min. IR spectra were recorded on a JASCO FT/IR-480 plus Fourier transform infrared spectrometer. The gel permeation chromatography (GPC) measurements were performed on Waters 410 system with RI (refractive index) detector against polystyrene standards with THF or polyethylene oxide (PEO) standards with water (NaCl solution) as an eluent. Polymer samples (finely divided powder or solutions) irradiations were carried out with Co^{60} γ radiation facility at Beijing Radiation Application Research Centre. Fluorescence emission spectra were recorded on a Hitachi F-4500 fluorescence spectrophotometer. Fluorescence quantum yields of the polymers were measured in water, and calculated by using quinine sulfate in 0.1 N sulfuric acid as the reference absolute quantum efficiency (55%).[S1] Fluorescence confocal laser scanning images were recorded with an Olympus FV1000-IX81. Dynamic light scatting (DLS) experiments were carried out with ALV5000 Laser Light Scattering Instrument.

[S1]. J. N. Demasa; G. A. Crosby, *J. Phys. Chem.* **1971**, *75*, 991.

1. Physical Properties of polymers

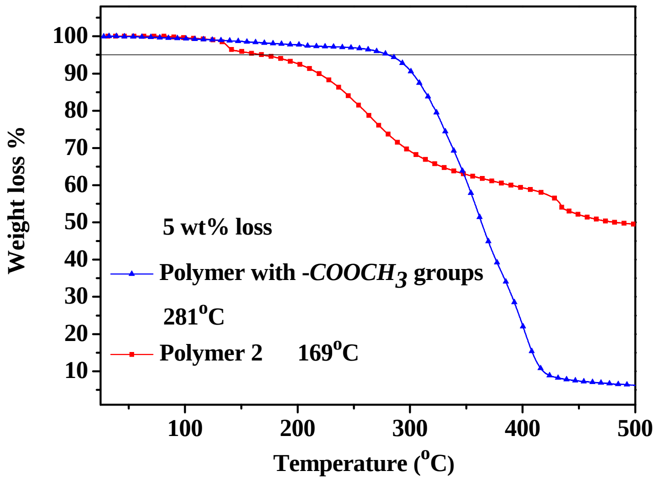


Fig. S1. TGA curves of the polymer with -$COOCH_3$ groups and polymer **2** (heating rate: 10 K/min from 20 °C to 500 °C under nitrogen atmosphere).

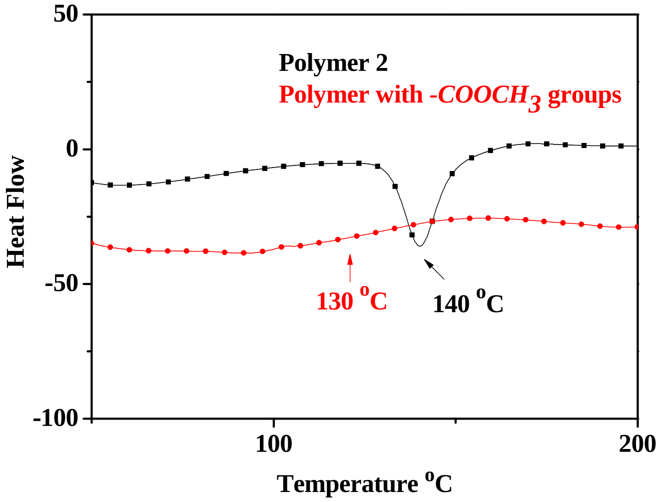


Fig. S2. DSC curves of the polymer with -$COOCH_3$ groups and polymer **2** (heating rate: 10 K/min from 20 °C to 500 °C under nitrogen atmosphere).

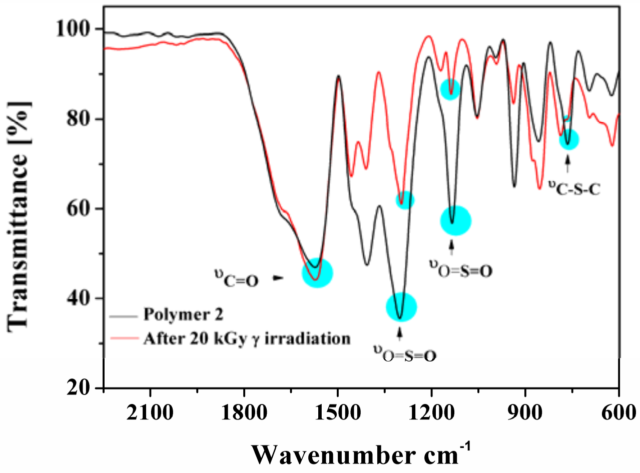


Fig. S3. FT-IR transmittance spectra of polymer **2** in the form of compressed KBr pellets before and after 20 kGy dose of gamma-ray irradiation.

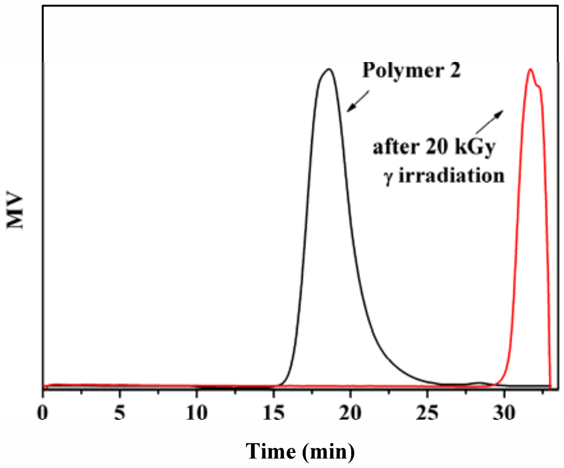


Fig. S4. GPC curves of polymer **2** before and after 20 kGy dose of gamma-ray irradiation with water as eluent; the molecular weight of polymer **2** was estimated to be M_n = 20,000, PDI = 1.63, and after irradiation, the molecular weight of the resulting species was too low reaching the instrument limit.

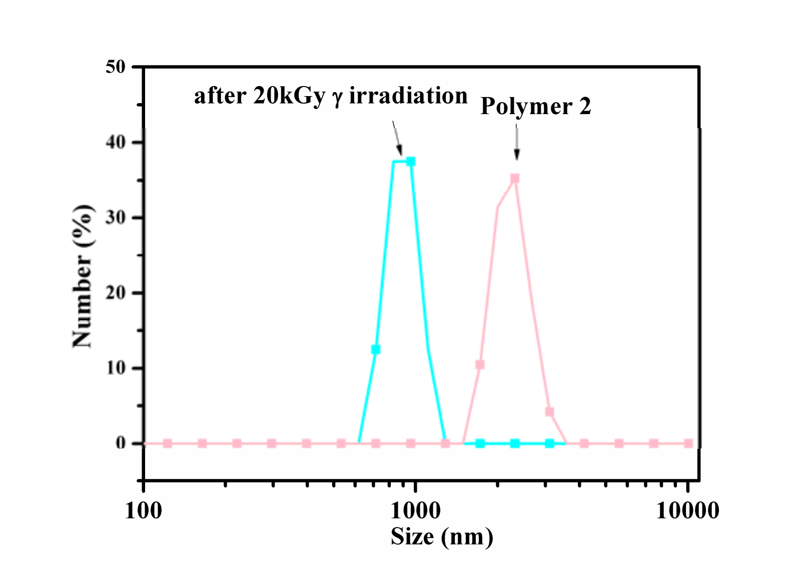


Fig. S5. Dynamic light scattering data for the aqueous solution of silole **1** (1.0 × 10 $^{-5}$ M) and polymer **2** (15 mgL^{-1}) before and after 20 kGy dose of gamma-ray irradiation which was exposed to polymer **2** (15 mgL^{-1}).

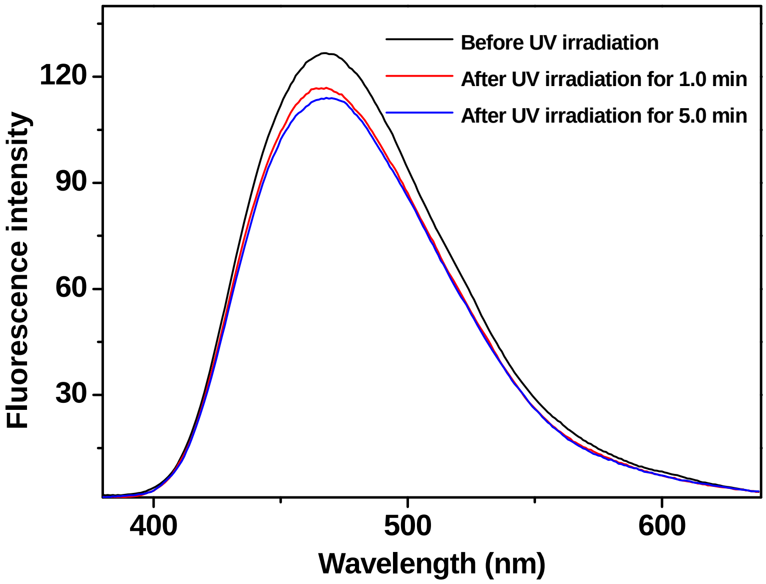
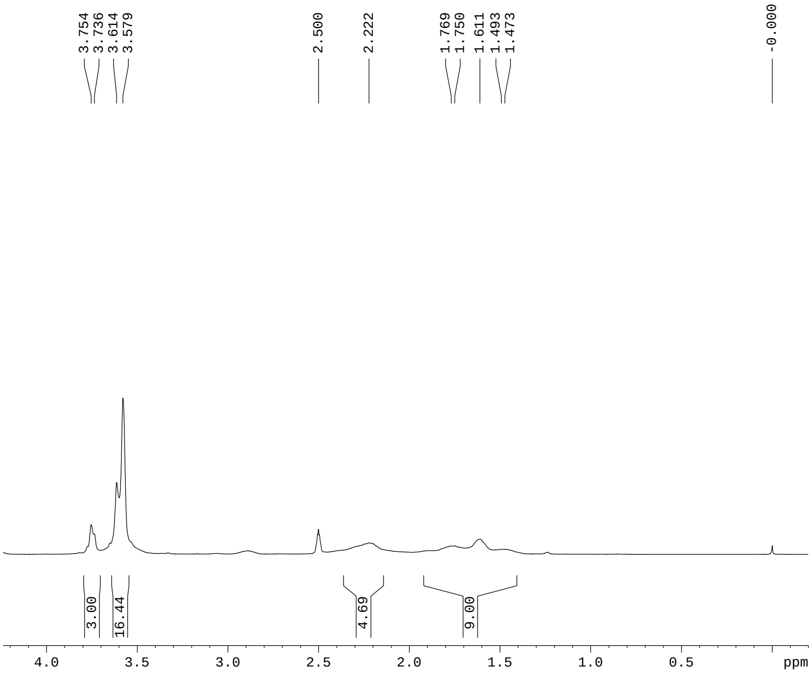


Fig. S6. Fluorescence spectrum ($\lambda_{ex.}$ = 370 nm) of the aqueous solution of silole **1** (1.0 × 10 $^{-5}$ M) and polymer **2** (15 mgL^{-1}) and those after exposure to UV radiation (23 mW/cm^2) for 1.0 min and 5.0 min at room temperature; the aqueous solution of polymer **2** (15 mgL^{-1}) was firstly exposed to UV radiation and then the solution was mixed with silole **1** (1.0 × 10 $^{-5}$ M) for recording the fluorescence spectrum.

2. ^{1}H NMR and FTIR spectra of the polymer with –COOCH$_3$ and polymer2

Polymer with -COOCH$_3$ groups



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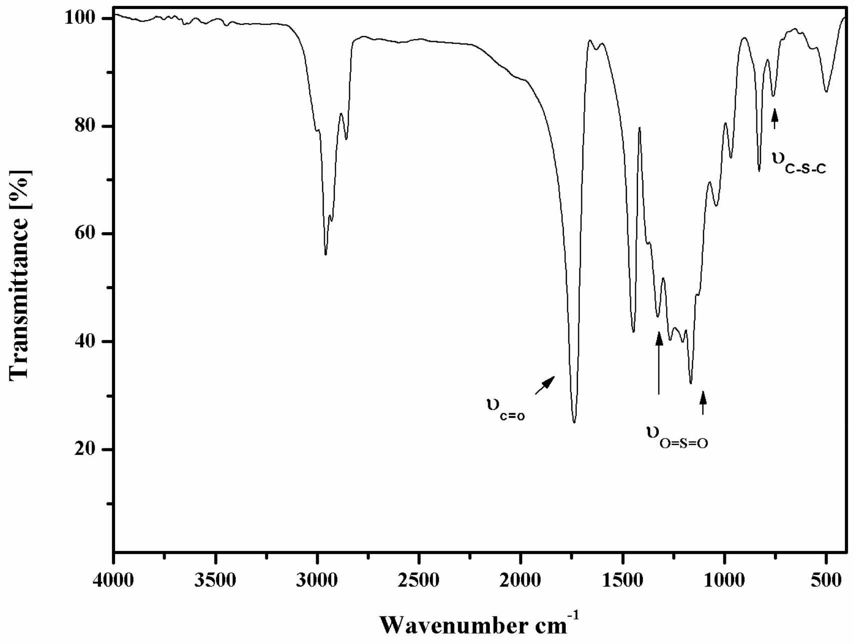
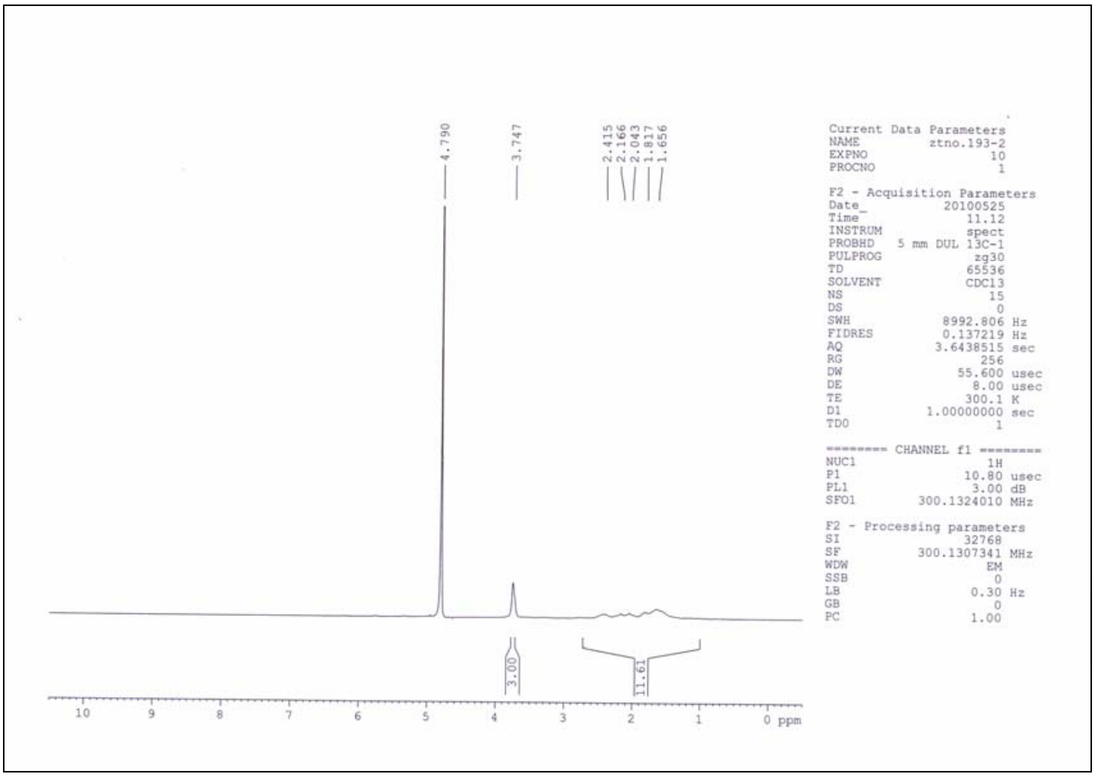


Polymer 2



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