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Supporting Information for

Irreversible destruction of amyloid fibril plaques by conjugated polymer based fluorogenic nanogrenades

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S1. Additional figures

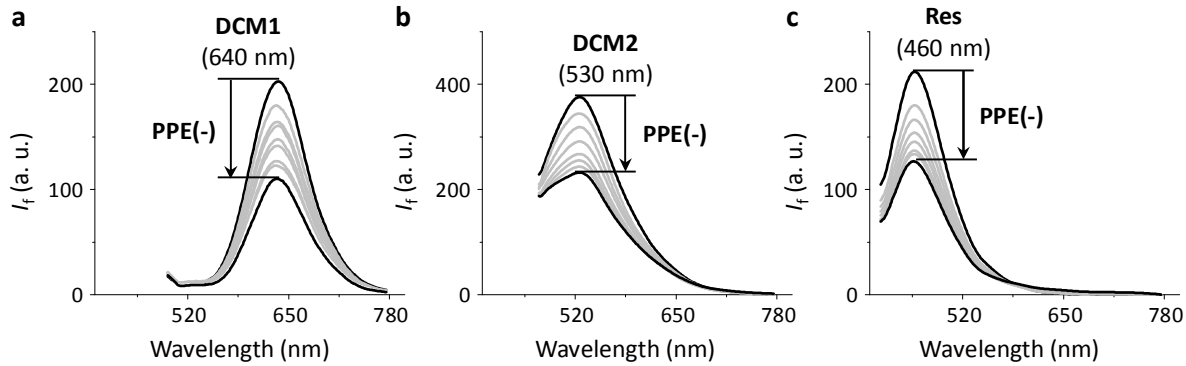


Figure S1. Fluorescence titration of different fluorescent dyes (2 μM for **DCM1** and 5 μM for **DCM2** and **Res**) with increasing **PPE(-)** (0-45 μM for **DCM1** and 0-70 μM for **DCM2** and **Res**) in Tris-HCl buffer (0.01 M, pH 7.4). Excitation wavelengths for **DCM1** ($\lambda_{em/max}$ = 640 nm), **DCM2** ($\lambda_{em/max}$ = 530 nm) and **Res** ($\lambda_{em/max}$ = 460 nm) are 460, 420 and 365 nm, respectively.

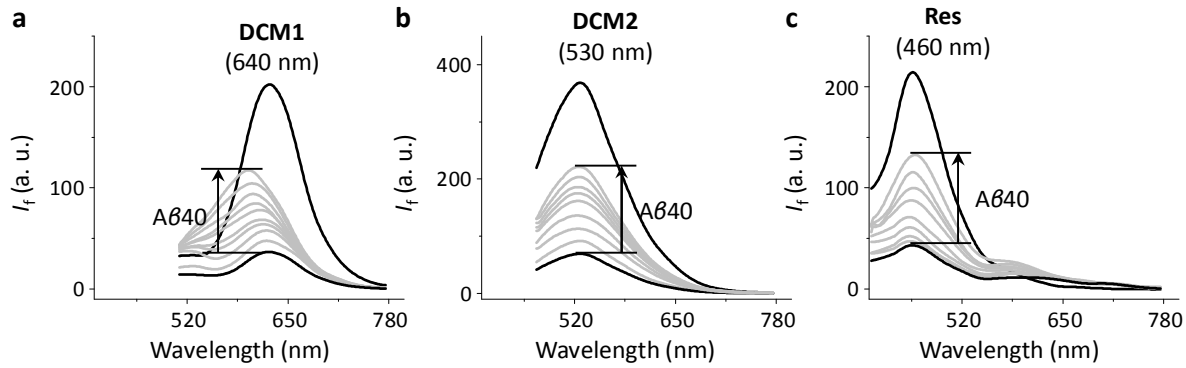


Figure S2. Fluorescence titration of different nanogrenades (45 μM **PPE(+)** with 2 μM **DCM1** and 70 μM **PPE(+)** with 5 μM **DCM2**/**Res**) in Tris-HCl buffer (0.01 M, pH 7.4) with increasing monomeric Aβ40 (0-50 μM for **DCM1,** 0-50 μM for **DCM2** and 0-45 μM for **Res**). Excitation wavelengths for **DCM1** ($\lambda_{em/max}$ = 640 nm), **DCM2** ($\lambda_{em/max}$ = 530 nm) and **Res** ($\lambda_{em/max}$ = 460 nm) are 460, 420 and 365 nm, respectively.

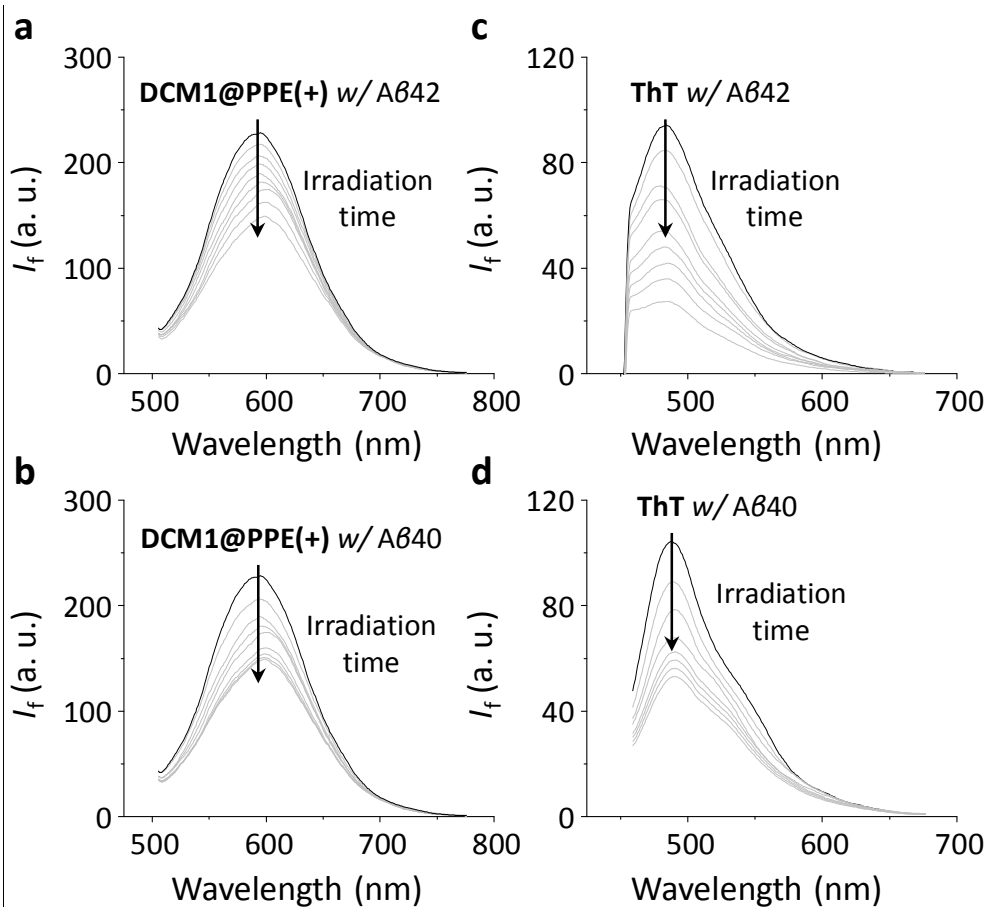


Figure S3. Fluorescence titration of **DCM1@PPE(+)** (2/50 μM) in Tris-HCl buffer (0.01 M, pH 7.4) with (*w/*) (a) Aβ42 fibril plaques (50 μM) and (b) Aβ40 fibril plaques (50 μM) upon white-light irradiation (40 mW cm^{-2}) with time (0-25 min). Fluorescence titration of Thioflavin T (**ThT**, 2 μM) in Tris-HCl buffer (0.01 M, pH 7.4) with (c) Aβ42 fibril plaques (50 μM) and (d) Aβ40 fibril plaques (50 μM) upon white-light irradiation with time (0-25 min). Excitation wavelength = 460 and 425 nm for **DCM1** and **ThT**, respectively.

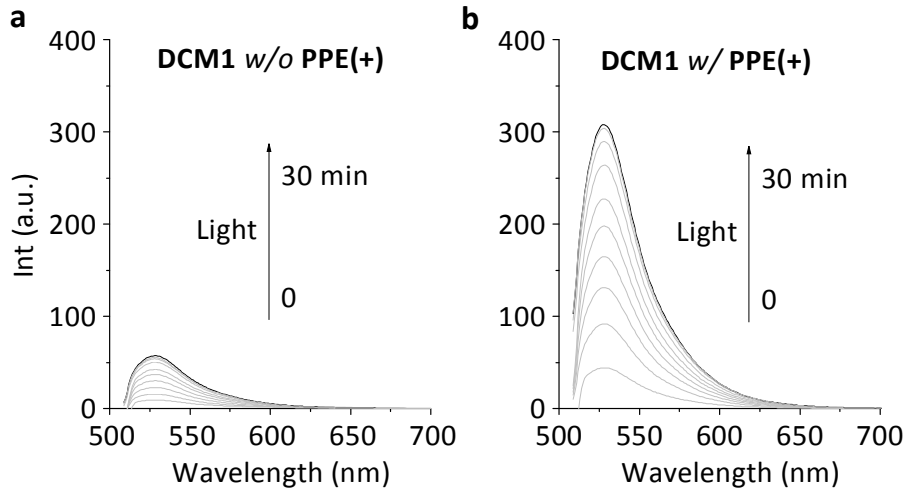


Figure S4. Fluorescence titration of dihydrorhodamine-123 (**DHR123**, a trapper of reactive oxygen species, 2 μM) in Tris-HCl buffer (0.01 M, pH 7.4) in the presence of **DCM1** (2 μM) without (*w/o*) (a) and with (*w/*) (b) **PPE(+)** (50 μM) upon white-light irradiation (40 mW cm^{-2}) with time (0-30 min). Excitation wavelength = 485 nm.

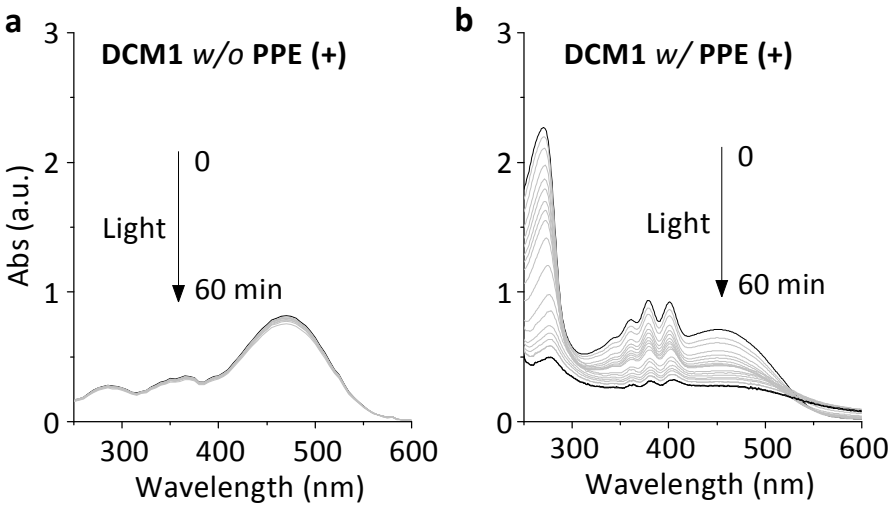


Figure S5. UV absorbance titration of 9,10-diphenylanthracene (**DPA**, a trapper of signlet oxygen, 20 μM) in Tris-HCl buffer (0.01 M, pH 7.4) in the presence of **DCM1** (2 μM) without (*w/o*) (a) and with (*w/*) (b) **PPE(+)** (50 μM) upon white-light irradiation (40 mW cm^{-2}) with time (0-60 min).

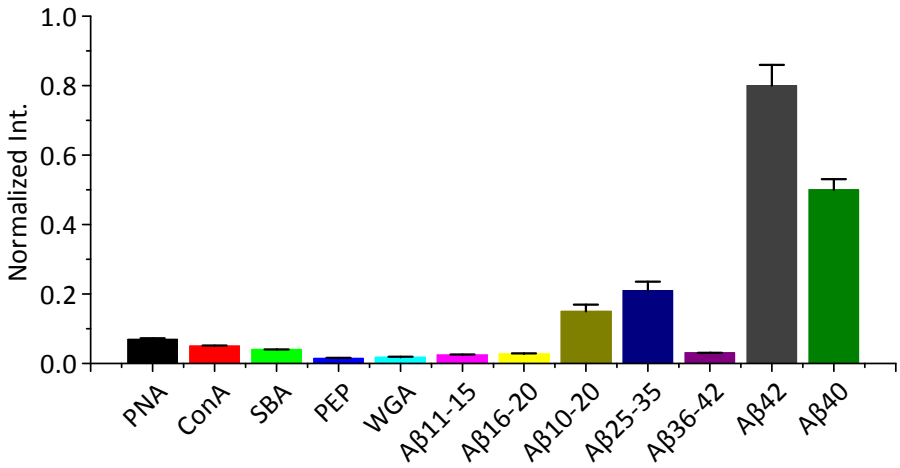


Figure S6. Fluorescence response of **DCM1@PPE(+)** (2/50 μM) in Tris-HCl buffer (0.01 M, pH 7.4) in the presence of a range of proteins and peptides (50 μM). Excitation wavelength = 460 nm. Abbreviations: peanut agglutinin (PNA), concanavalin A (Con A), soybean agglutinin (SBA), pepsin (PEP), wheat germ agglutinin (WGA), and the peptides are shortened Aβ monomers. Normalized Int. is the ratio of the fluorescence intensity of **DCM1** alone to that of **DCM1@PPE(+)** in the presence of an analyte.

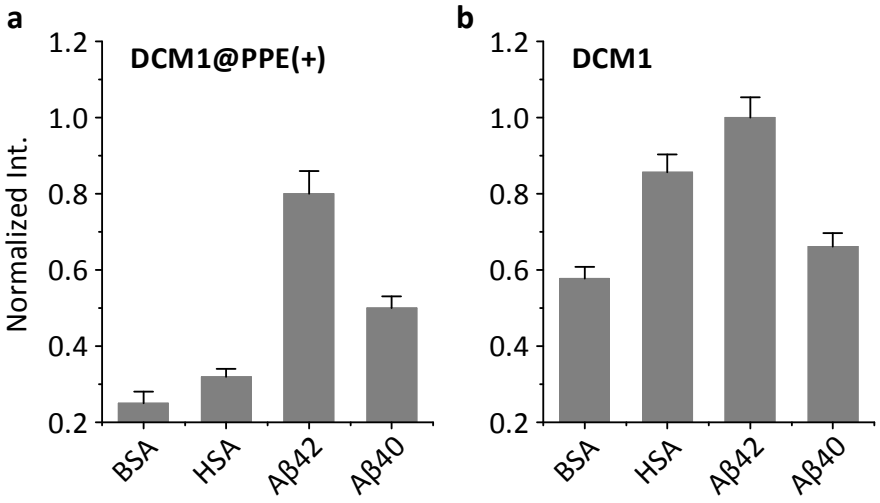


Figure S7. Fluorescence response of (a) **DCM1@PPE(+)** (2/50 μM) and (b) **DCM1** alone (2 μM) in Tris-HCl buffer (0.01 M, pH 7.4) in the presence of different proteins and peptides (50 μM). Excitation wavelength = 460 nm. Abbreviations: bovine serum albumin (BSA) and human serum albumin (HSA). For Fig. 7a, normalized Int. is the ratio of the fluorescence intensity of **DCM1** alone to that of **DCM1@PPE(+)** in the presence of an analyte. For Fig. 7b, normalized Int. is the ratio of the fluorescence intensity of **DCM1** with Aβ42 to that of **DCM1** with an analyte.

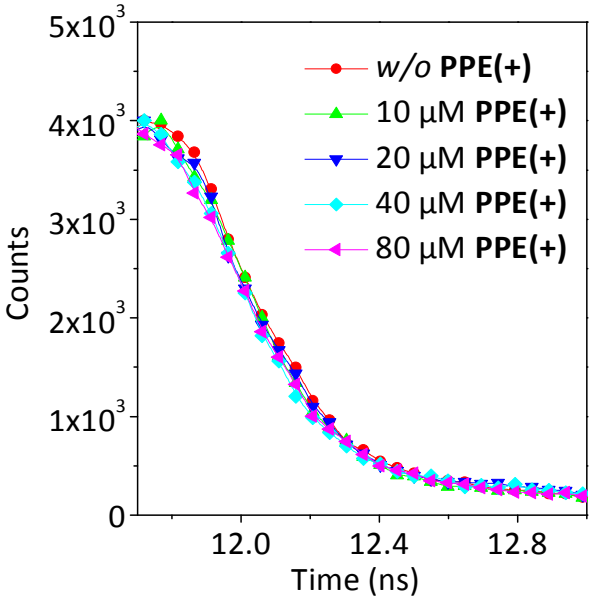


Figure S8. Time-resolved fluorescence decay of **DCM1** (10 µM) in Tris-HCl buffer (0.01 M, pH 7.4) without (*w/o*) and with increasing **PPE(+)**.

S2. Experimental Section

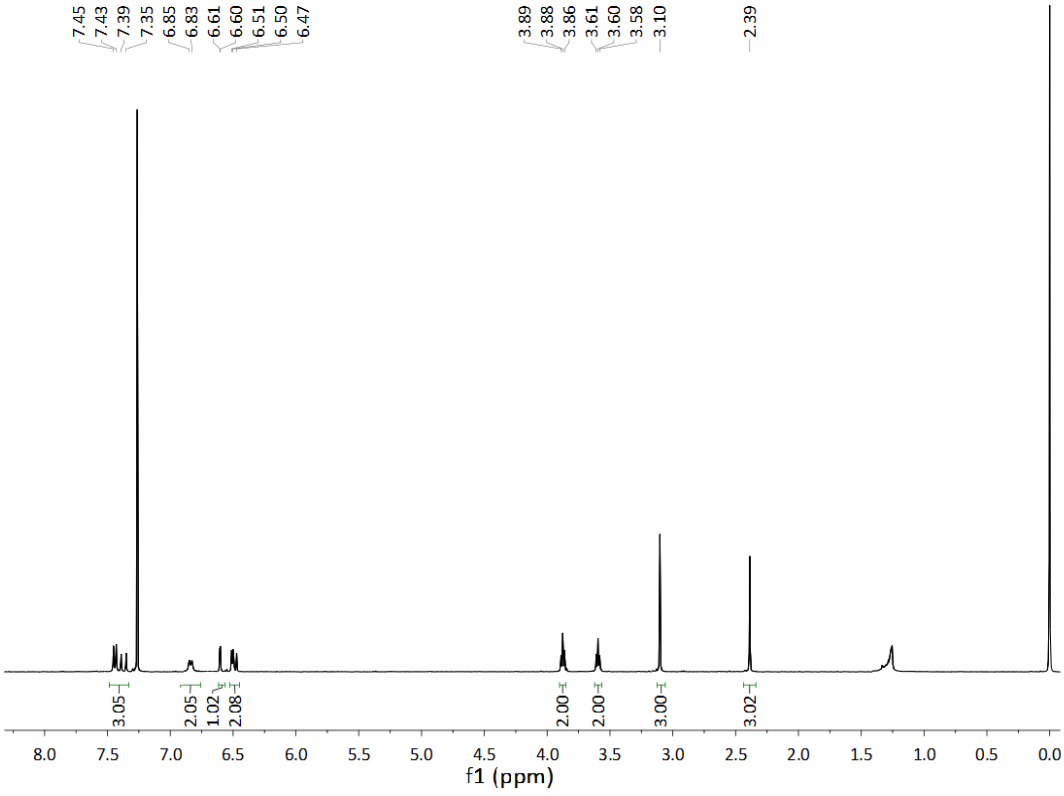
General. All purchased chemicals and reagents are of analytical grade. Resveratrol was purchased from J&K Chemical. Amyloid β peptides were purchased from GL Biochem (shanghai) Ltd. ^{1}H NMR spectra were recorded on a Bruker AM 400MHz spectrometer with tetramethylsilane (TMS) as internal reference. Absorption spectra were measured on a Varian Cary 500 UV-Vis spectraphotometer. High Performance Liquid Chromatography (HPLC) was performed on a Shimadzu Prominence Series equipment. Transmission electron microscopy (TEM) images were obtained on a JEOL 100CX transmission electron microscope operating at an accelerating bias voltage of 100 kV. Scanning electron microscopy (SEM) images were obtained on an S-3400N (HITACHI, Japan) scanning electron microscope with an accelerating voltage of 15 kV. Atomic force microscopy (AFM) images were obtained with Veeco/DI (USA). Dynamic light scattering (DLS) was carried out on a Horiba LB-550 Dynamic Light Scattering Nano-Analyzer.

Characterization of Compounds (DCM1[1] and DCM2[2] are known compounds).

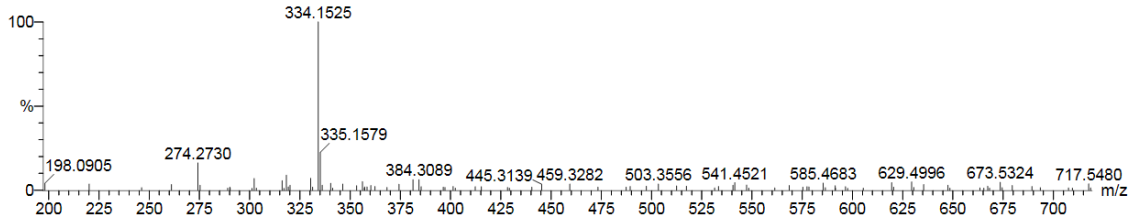
DCM1. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.41 (m, 3H), 6.84 (d, J = 8.1 Hz, 2H), 6.60 (d, J = 2.0 Hz, 1H), 6.53–6.45 (m, 2H), 3.88 (t, J = 5.6 Hz, 2H), 3.60 (t, J = 5.6 Hz, 2H), 3.10 (s, 3H), 2.39 (s, 3H).

HRMS (ESI, *m/z*): $[M + H]^+$ calcd for $C_{20}H_{19}N_3O_2$: 334.1556, found: 334.1525.

HPLC: t_R = 3.4 min over 15 min of 0.6 mL min^{-1} mobile phase (100% MeOH), purity 99%.



^{1}H NMR spectrum of **DCM1**

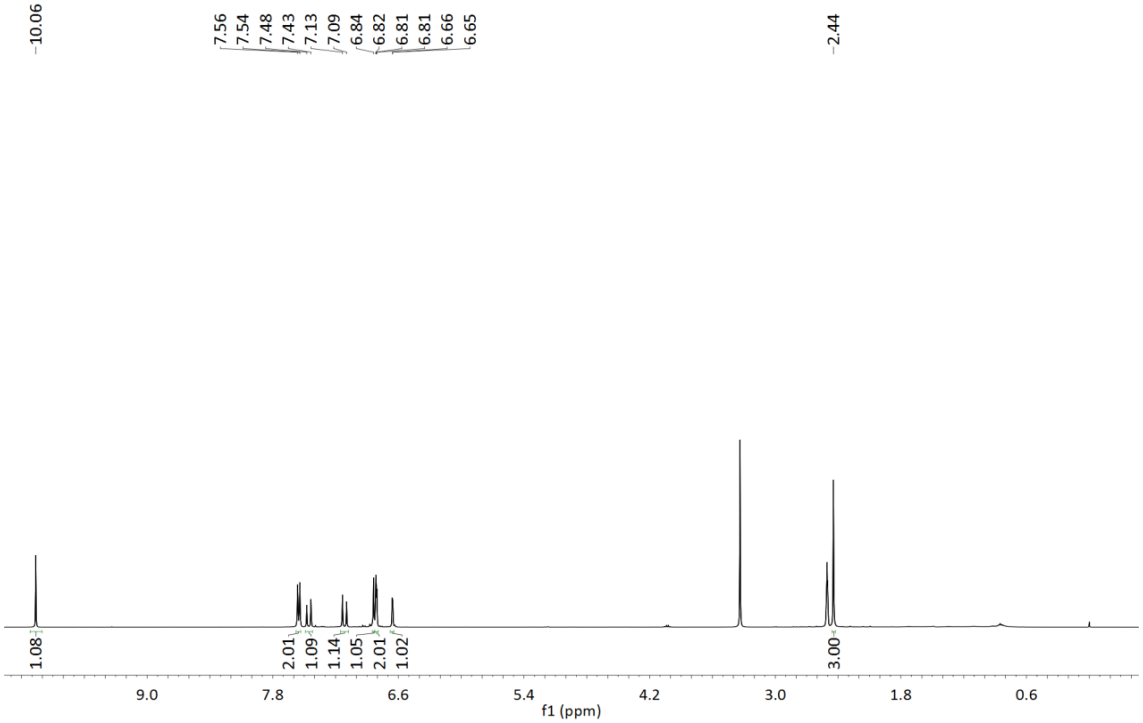


Mass spectrum of **DCM1**

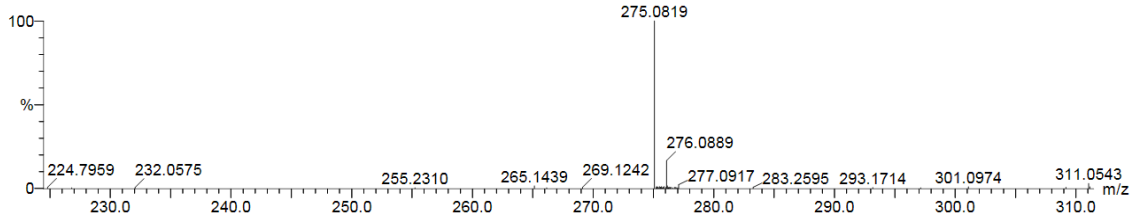
DCM2. ^{1}H NMR (400 MHz, DMSO-d_6): δ 10.06 (s, 1H), 7.55 (d, J = 8.6 Hz, 2H), 7.45 (d, J = 10.1 Hz, 1H), 7.11 (d, J = 11.2 Hz, 1H), 6.84 (s, 1H), 6.82–6.79 (m, 2H), 6.66 (d, J = 1.3 Hz, 1H), 2.44 (s, 3H).

HRMS (ESI, *m/z*): [M] calcd for $C_{17}H_{11}N_2O_2^-$: 276.0821, found: 275.0819.

HPLC: t_R = 2.9 min over 15 min of 0.6 mL min^{-1} mobile phase (100% MeOH), purity 99%.



^{1}H NMR spectrum of **DCM2**

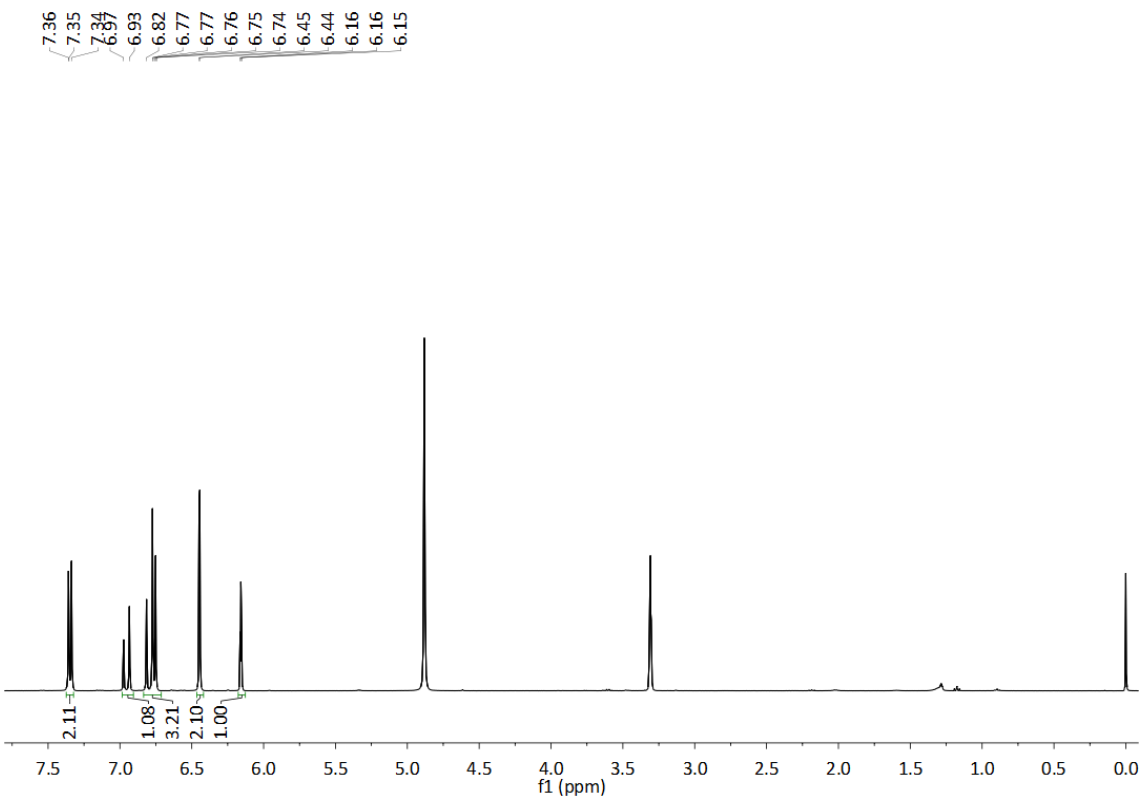


Mass spectrum of **DCM2**

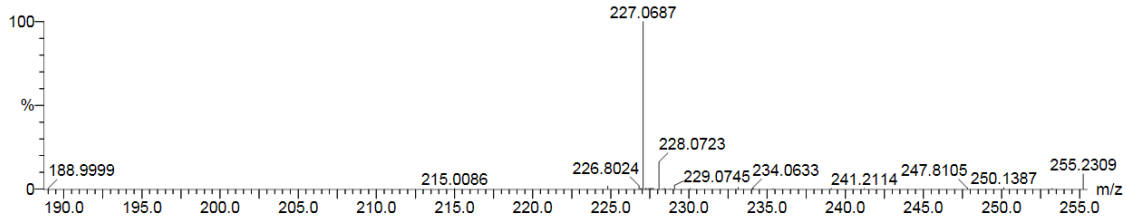
Resveratrol (Res). ^{1}H NMR (400 MHz, MeOD): δ 7.37–7.32 (m, 2H), 6.95 (d, J = 12.3 Hz, 1H), 6.84–6.71 (m, 3H), 6.45 (d, J = 2.1 Hz, 2H), 6.16 (t, J = 2.1 Hz, 1H).

HRMS (ESI, *m/z*): [M] calcd for $C_{14}H_{11}O_3^-$: 227.0708, found: 228.0687.

HPLC (t_R = 2.6 min over 15 min of 0.6 mL min^{-1} mobile phase (100% MeOH), purity 99%.



^{1}H NMR spectrum of **Res**



Mass spectrum of **Res**

Fluorescence Spectroscopy. In a typical fluorescence quenching assay, a fluorescent dye was incubated with **PPE** of different concentrations in Tris-HCl (0.01 M, pH 7.4) for 30 s, and then the fluorescence was measured on a Varian Cary Eclipsefluorescence spectrophotometer with excitation of 460, 420 and 365 nm for **DCM1**, **DCM2** and **Res**, respectively. In a typical fluorescence recovery assay, Aβ of different concentrations were added to the mixture of fluorescent dye and **PPE**. Then, the resulting mixture was incubated at 25 °C for 10 min.

Then, the fluorescence was measured at room temperature with excitation of 460, 420 and 365 nm for **DCM1**, **DCM2** and **Res**, respectively.

Determination of Reactive Oxygen Species (ROS). In a typical ROS assay, **PPE(+)** was dropped into Tris-HCl buffer (0.01 M, pH 7.4), and then the mixture was incubated with protoporphyrin IX (**PpIX**) and dihydrorhodamine-123 (**DHR123**) without light for 30 minutes. Then the fluorescence of **DHR123** was measured on a Varian Cary Eclipse fluorescence spectrophotometer upon white light (40 mV cm^{-2}) irradiation (0-25min) with an excitation of 485 nm.

S3. Additional References

1. Z. Guo, P. Zhao, W. Zhu, X. Huang, Y. Xie and H. Tian, *J. Phys. Chem. C*, 2008, **112**, 7047-7053.
2. Y. Cui, J. Yu, J. Gao, Z. Wang and G. Qian, *J. Sol-Gel Sci. Technol.*, 2009, **52**, 362-369.