Supporting Information for

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

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**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 (λ<sub>em/max</sub> = 640 nm), DCM2 (λ<sub>em/max</sub> = 530 nm) and Res (λ<sub>em/max</sub> = 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 spectrophotometer. 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$_3$): $^\delta$ 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]$^+$ calcld for C$_{20}$H$_{19}$N$_3$O$_2$: 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
DCM2. $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 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$_2$O$_2$: 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%.
Resveratrol (Res). $^1$H NMR (400 MHz, MeOD): $\delta$ 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%.

![1H NMR spectrum of Res](image)

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 Eclipse fluorescence 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 dihydrodorhodamine-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**
