Electronic Supplementary Information (ESI)

Switch of the magnetic field effect on photon upconversion based on sensitized triplet–triplet annihilation

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Materials

Platinum(II) octaethylporphyrin (PtOEP, Sigma-Aldrich), 9,10-diphenylanthracene (DPA, Sigma-Aldrich), and toluene (Wako Pure Chemical Industries, Special Grade) were used as received without further purification.

Measurements

The concentration of PtOEP in toluene was kept constant at 0.15 mM, while those of DPA in toluene were at 1 and 50 mM. The toluene solutions of PtOEP and DPA in a quartz cell was deoxygenated by repeated freeze–pump–thaw cycles to avoid the influence of oxygen. The steady-state absorption spectra of the toluene solutions were recorded on a Shimadzu UV-3150 spectrometer. The steady-state fluorescence spectra of the toluene solutions were measured on a JASCO FP6500 spectrometer with a photomultiplier (Hamamatsu Photonics R928).

PUC measurement was made using a 532 nm CW DPSS laser (MGL-III-C-100 mW, Changchun New Industries) and a JASCO FP6500 spectrometer with a photomultiplier (Hamamatsu Photonics R928) attached with custom-modified optical fiber accessory (OBF-123, JASCO) using a short pass filter (SV0510, Asahi Spectra) with cell holder modification as described below, from the previous paper[1]. The incident laser power density of CW-laser was recorded by a laser power & energy meter (Nova, OPHIR). The TTA-UC quantum yield Φ(UC) was determined by the measurements of relative fluorescence intensities using rhodamine 6G according the previous papers.[2-4]

The cell holder was placed in the pole gap of an electromagnet. The magnetic field strength was measured by a gauss meter (410 Gaussmeter, Lake Shore).The custom-modified water thermostattable cell holder equipped with optical fiber for the custom-modified optical fiber accessory (OBF-123, JASCO) or the custom-modified optical fiber. coupler (P/N 206-22312-91, Shimadzu). The temperature of the sample solutions was controlled by circulating temperature-controlled water through a temperature-controlled bath.

Supporting figures

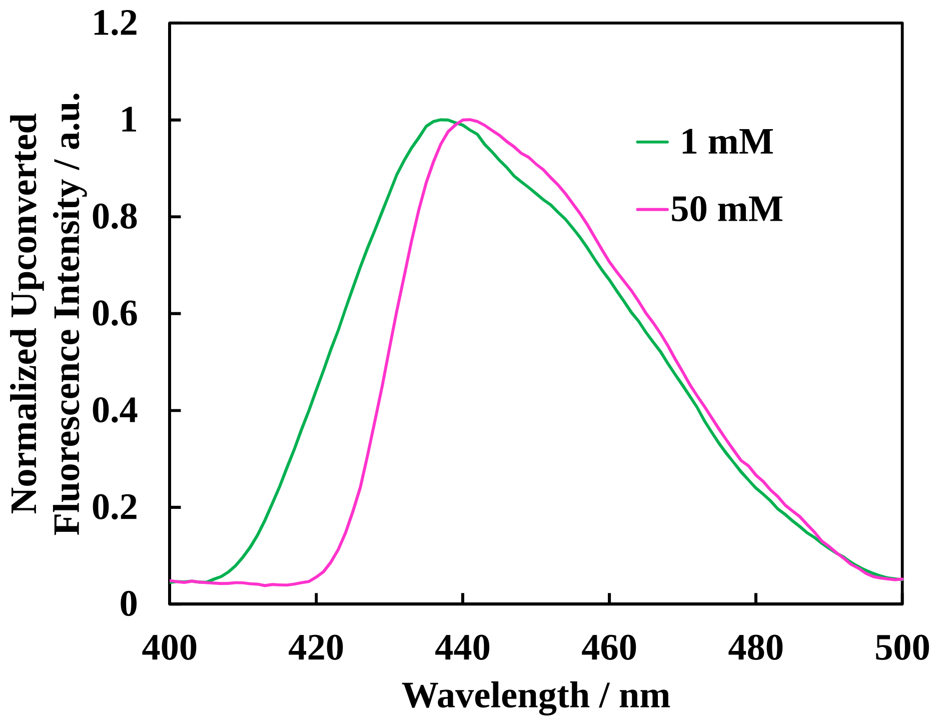

Fig. S1 Steady-state upconverted fluorescence spectra of PtOEP-DPA(1 mM) and PtOEP-DPA(50 mM) excited at 532 nm in toluene at 298 K at 10.9 mW cm^{-2}.

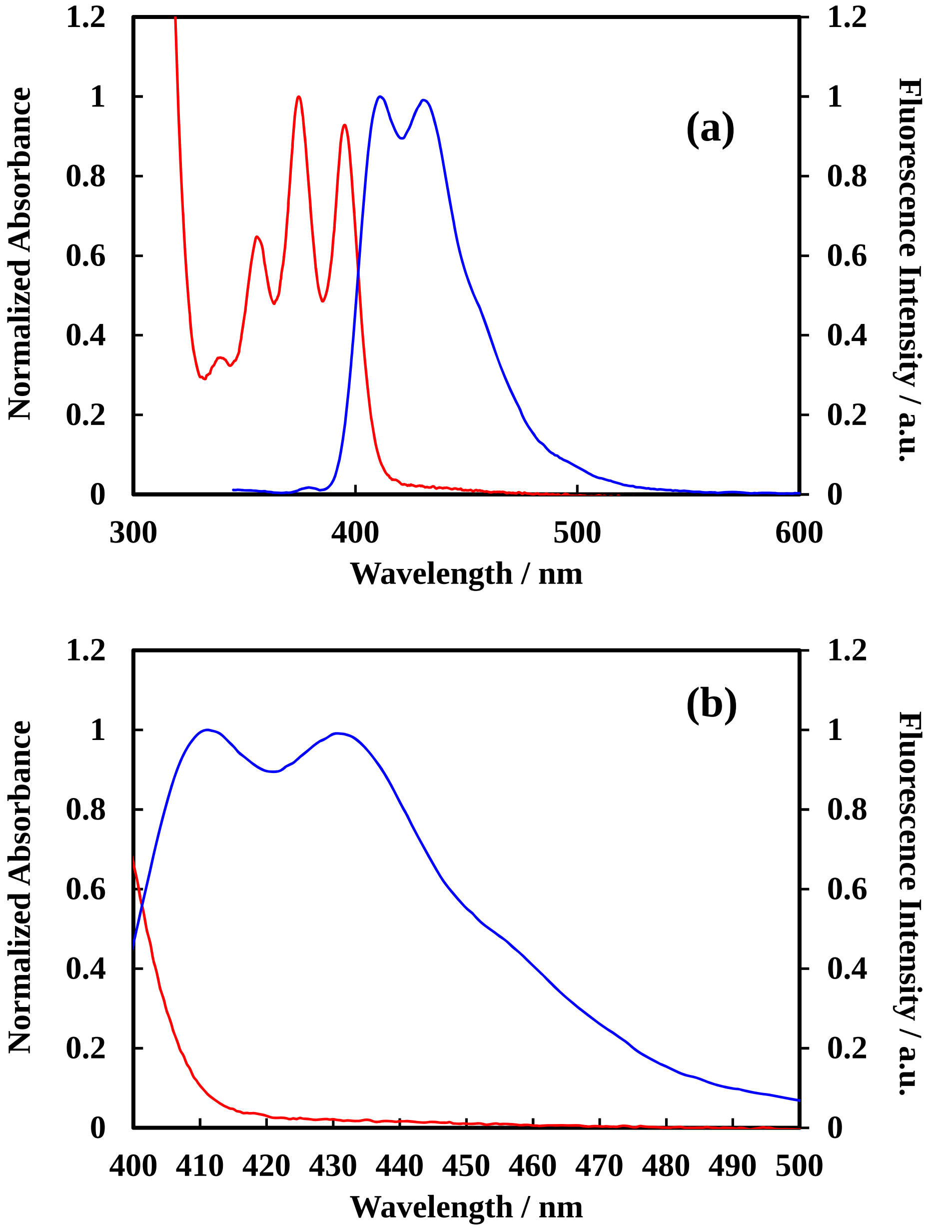

Fig. S2 Absorption and fluorescence spectra of DPA(2 μM) in toluene at (a) 300–600 nm and (b) 400–500 nm (an enlarged view) regions at room temperature.

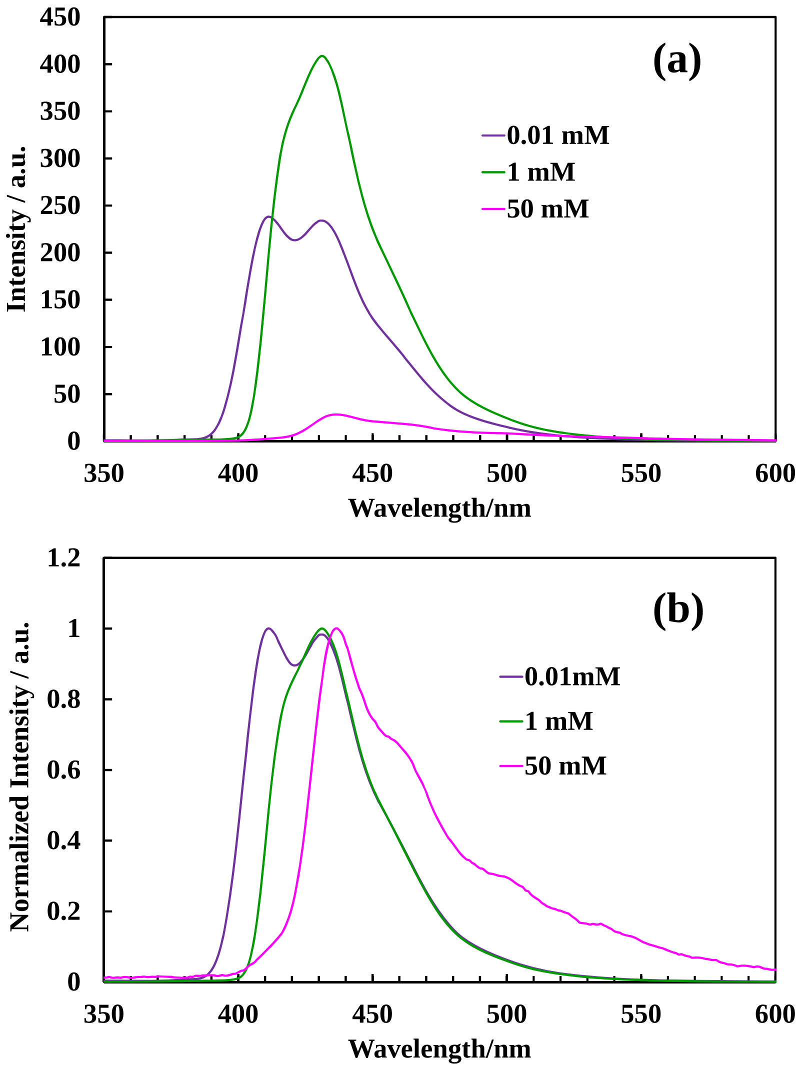

Fig. S3 (a) Fluorescence spectra and (b) normalized fluorescence spectra of DPA (0.01, 1, 50 mM) excited at 339 nm in toluene at room temperature without a short pass filter (SV0510, Asahi Spectra) measured on a JASCO FP6500 spectrometer with a photomultiplier (Hamamatsu Photonics R928).

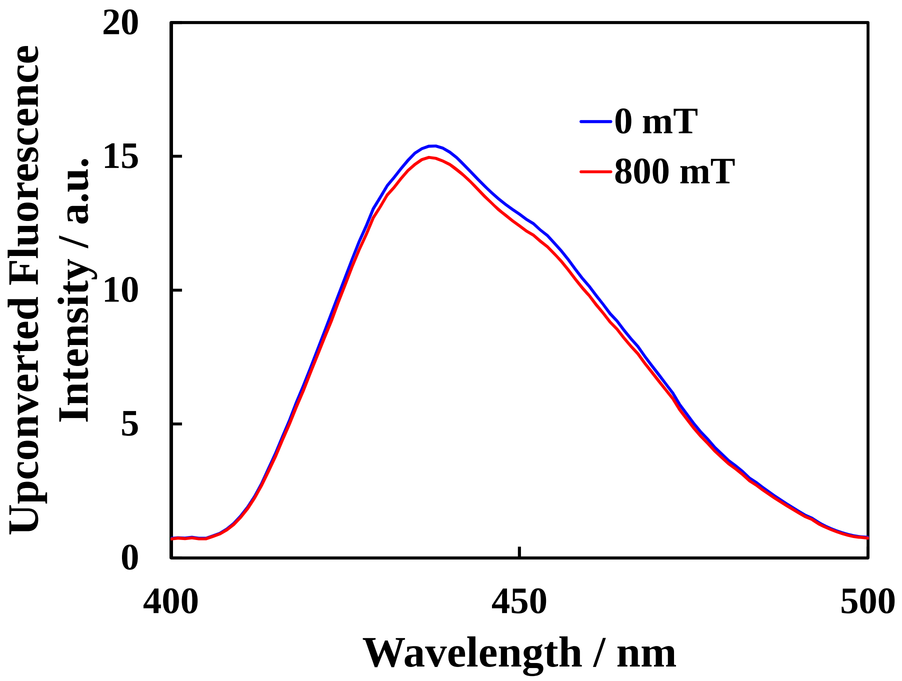

Fig. S4 Magnetic field effects on upconverted fluorescence spectra of PtOEP-DPA(1 mM) excited at 532 nm in toluene at 298 K in the absence and the presence of magnetic field (800 mT) at 13.6 mW cm^{-2} without a short pass filter (SV0510, Asahi Spectra).

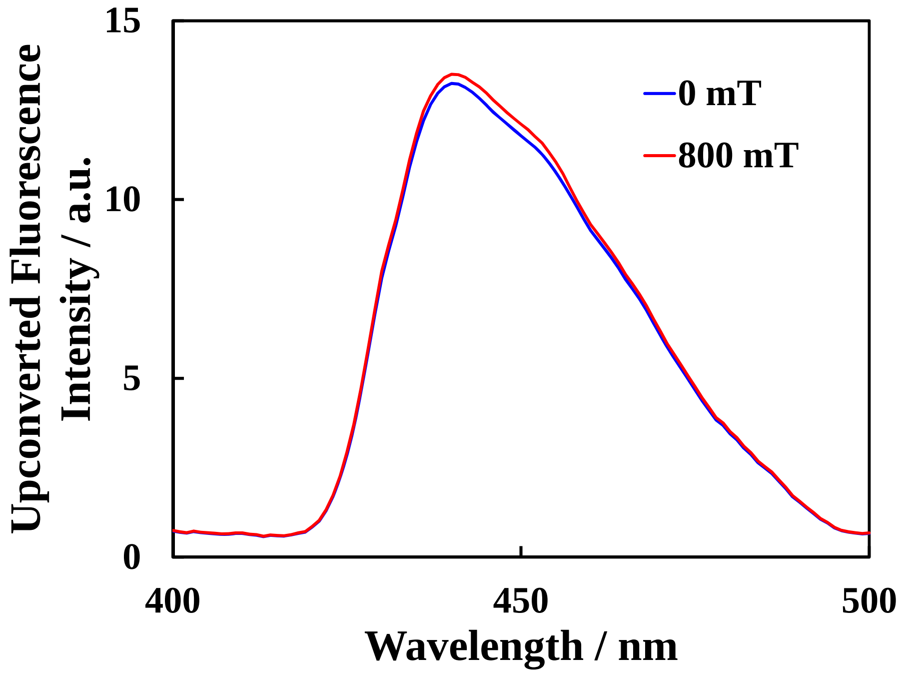

Fig. S5 Magnetic field effects on upconverted fluorescence spectra of PtOEP-DPA(50 mM) excited at 532 nm in toluene at 298 K in the absence and the presence of magnetic field (800 mT) at 13.6 mW cm^{-2} without a short pass filter (SV0510, Asahi Spectra).

Supporting references

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