Electronic Supplementary information

Red thermally activated delayed fluorescence material as triplet sensitizer for triplet-triplet annihilation up-conversion with high efficiency and low energy loss

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General Information

Absorption spectra were recorded on a SHIMADZU UV-2700 spectrophotometer. Fluorescence spectra were measured by using a HITACHI F-4600 fluorescence spectrometer. Up-converted emission spectra were recorded on HITACHI F-4600 with the excitation source using an external, adjustable, continuous semiconductor laser (532 nm, LSR532H-2W). The luminescence decay was carried out on CHI FLS-920 with the laser of 377 nm.

Determination of the Φ_{ISC} of BTZ-DMAC

The Φ_{ISC} of BTZ-DMAC was calculated according to following formula:

$$\phi_{ISC} = \frac{\phi_{DF}}{\phi_{DF} + \phi_{PF}} = \frac{R_{DF}\phi}{\phi} = R_{DF}$$

Where Φ_{ISC}, Φ_{DF}, Φ_{PF} and R_{DF} represent the efficiency of ISC, the quantum yield of delayed fluorescence, the quantum yield of promoted fluorescence and the proportion of delayed fluorescence, respectively.

Determination of TTA-UC quantum yield

The TTA-UC quantum yield in deaerated benzene was calculated relative to a standard. Rhodamine 6G in ethanol (0.1 μM, Φ_{std} = 95%).

$$\Phi_{UC} = \Phi_{std}\,(A_{std} / A_{UC})(I_{UC} / I_{std}) = 0.5\Phi_{UC'}$$

Where Φ, *A*, and *I* represent the quantum yield, absorbance at 532 nm, and integrated fluorescence spectral profile.

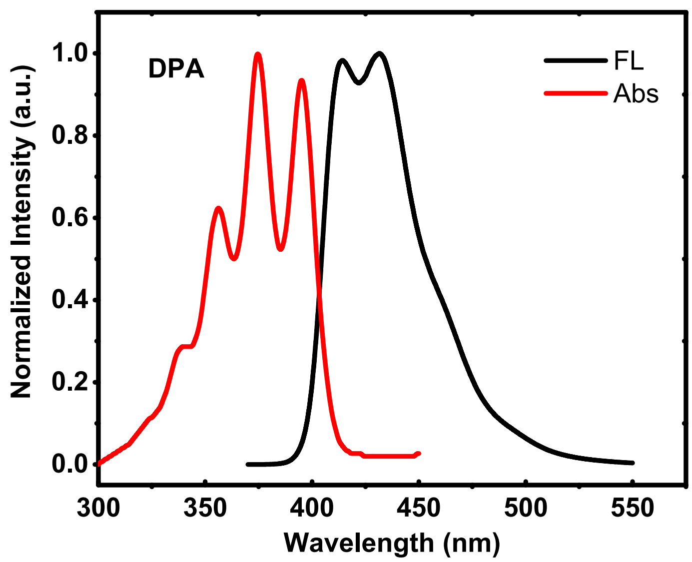

Fig. S1 The absorption and emission spectra of DPA (5 mM) in toluene.

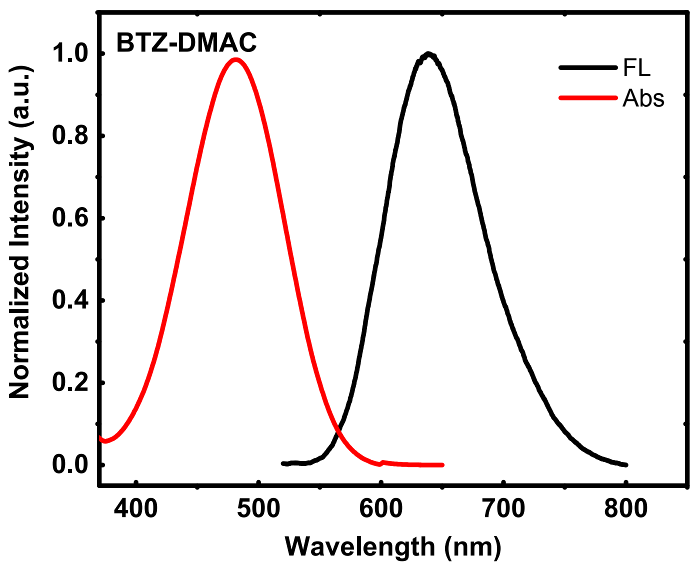

Fig. S2 The absorption and emission spectra of BTZ-DMAC (1 mM) in toluene.