Broadband light-absorbing BODIPY-C60-distyryl BODIPY triad as heavy-atom-free organic triplet photosensitizers.

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Triplet photosensitizers have gained much attention due to their wide range of applications in photocatalysis, photodynamic therapy and triplet-triplet annihilation (TTA) upconversion.[1] To date, most of the triplet photosensitizer are based on heavy-atom effect while very few systems were reported for heavy-atom free organic triplet photosensitizers. In this work, we studied the triplet excited state properties of a novel broadband light-capturing multi-BODIPY-fullerene-based triad and its control dyads.[2] The two differently functionalized BODIPY units mounted on the two arms of a C_{60} core results in an extended UV visible absorption spectrum (300-700 nm), due to the cumulative absorptions of the two BODIPYs. Photoinduced processes leading to the formation of triplet states were elucidated in this family by steady-state and time-resolved emission, as well as transient absorption spectroscopy. Excitation of BODIPY chromophores can lead to the formation of a triplet state centered on C_{60} or the BODIPY moieties depending on the BODIPY structure. The use of these assemblies as potential organic triplet photosensitizers for triplet-triplet annihilation up-conversion was demonstrated. This work is useful for the development of a new wideband light-capturing, heavy-atom-free organic triplet photosensitizer, with an appreciably long triplet lifetime (280 µs) at room temperature.

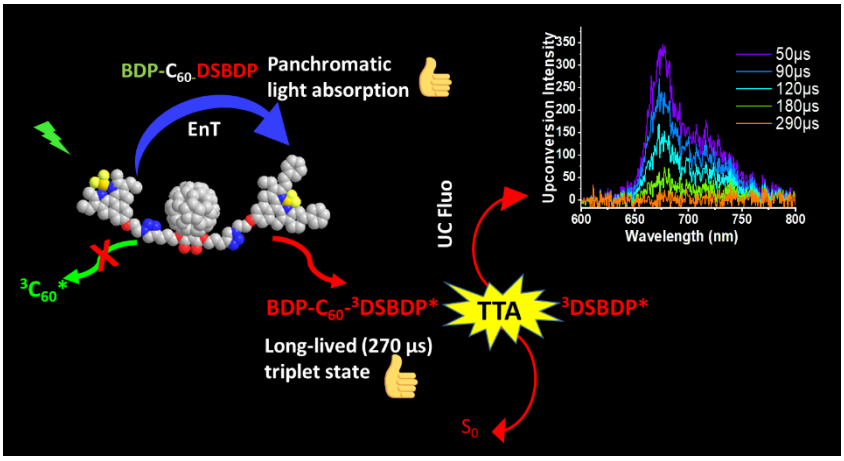

Figure 1. Formation of a long-lived triplet state on a broadband light-absorbing based on multi-BODIPY-fullerene triad.

[1] J. Zhao, W. Wu, J. Sun, S. Guo, *Chem. Soc. Rev.* **2013**, *42*, 5323-5351.
[2] A. Fatima, J. Rabah, E. Allard, H. Fensterbank, K. Wright, G. Burdzinski, G. Clavier, M. Sliwa, T. Pino, R. Méallet-Renault, K. Steenkeste, M.-H. Ha-Thi, *Photochem. Photobiol. Sci.* **2022**, *accepted.*