A new class of organic triplet photosensitizers for energy transfer catalysis and triplet-triplet annihilation upconverion

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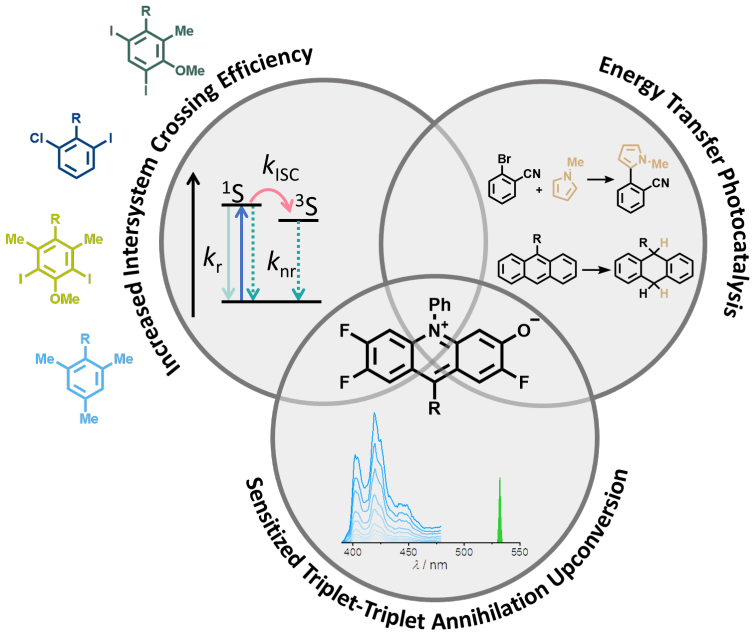

Triplet excited states play an increasingly important role in synthetic photochemical transformations,[1-3] and in the growing field of sensitized triplet-triplet annihilation upconversion.[4] Photosensitizers based on complexes of heavy (and sometimes very precious and rare) metals mediate efficient spin-orbit coupling to allow efficient intersystem crossing. Organic photosensitizers (PS) would be more sustainable and amenable to scaled-up processes but usually suffer from low spin-orbit coupling and poor quantum yields for intersystem crossing (ISC). Acridinium compounds are widely used organic PS, but usually react from singlet excited states, whereas ISC to triplets tends to be inefficient. We report on a new class of organic triplet PS, featuring a much higher photostability and an enhanced ISC efficiency compared to typical acridinium dyes. Our new isoacridone dyes have long-lived triplet excited states (up to 43.7 µs) storing roughly 1.9 eV, and ISC efficiencies up to 52 % are achievable. These new PS were successfully used for triplet-triplet energy transfer catalysis and for sensitized triplet-triplet annihilation upconversion with a pyrene derivative.

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[4] B. Pfund, D. M. Steffen, M. R. Schreier, M. Bertrams, C. Ye, K. Börjesson, O. S. Wenger, C. Kerzig, *J. Am. Chem. Soc.*, **2020**, 142, 10468-10476.