Thermally Activated Delayed Fluorescence and Room Temperature Phosphorescence: Molecular Designs, Synthesis and Optoelectronic Properties

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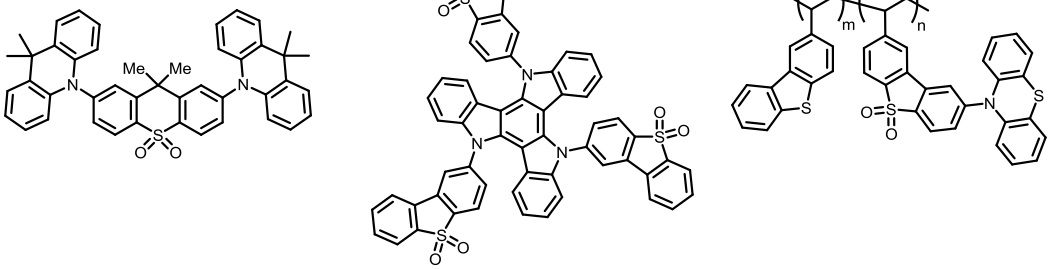
Thermally activated delayed fluorescence (TADF) and room temperature phosphorescence (RTP) can be induced and controlled by precise molecular design of donor-acceptor linked molecules, with particular emphasis on the extent of intramolecular charge transfer, the rigidity of the molecular framework and the dihedral angle between the donor and acceptor units, imparted by functionalization of the sub-units. These features have been rationally designed simultaneously to modulate the molecules' singlet-triplet gap and the rate of intersystem crossing for efficient utilization of triplet states. Representative building blocks include: phenothiazine, acridine and triazatruxene as donors, and dibenzothiophene-*S,S*-dioxide and 9,9-dimethylthioxanthene-*S,S*-dioxide as acceptor units. Obtaining deep-blue TADF has been a particular focus of our work.

Molecular designs, synthesis, photophysical studies, theoretical calculations and high efficiency organic light-emitting device (OLED) data will be presented from our collaboration with the groups of Andrew P. Monkman and Fernando B. Dias (Durham University, U.K.), and Thomas J. Penfold (Newcastle University, U.K.).



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