

Photophysical Characterization of Thermally Activated Delayed Fluorescence Emitters

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Thermally Activated Delayed Fluorescence (TADF) is a process in which an organic molecule can undergo a triplet-to-singlet energy transfer, allowing it to emit light through a fluorescence pathway rather than the traditional non-radiative phosphorescence pathway. In a TADF emitter, upon optical excitation, the molecule initially absorbs light and forms an excited singlet state. From this singlet state, through a process known as intersystem crossing (ISC), the molecule undergoes a non-radiative transition to a long-lived triplet state. The key feature of TADF is that the molecule can then transfer its energy back from the triplet state to the singlet state through a thermally activated process called reverse intersystem crossing (RISC) and subsequently emit light with high efficiency in organic electronic devices such as organic light-emitting diodes (OLEDs).

The photophysical characterization of TADF emitters plays a crucial role in understanding their light-emitting properties and optimizing their performance in OLEDs. This characterization involves studying various photophysical parameters such as emission spectra, photoluminescence quantum yield, triplet state dynamics, and singlet-triplet energy gap. By investigating these properties, we can gain insights into the underlying mechanisms of TADF and tailor the molecular structure of TADF emitters to enhance their efficiency and stability. Furthermore, advanced spectroscopic techniques, such as transient absorption and time-resolved photoluminescence spectroscopy, provide valuable information about exciton dynamics and the formation of triplet states, facilitating the design of highly efficient TADF materials for future OLED applications. In this talk, I'll briefly introduce TADF emitters, discuss their photophysical characterization using various spectroscopic techniques, and discuss the utilization of TADF emitters in fabricating highly efficient OLEDs.

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References

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