

# Design, Synthesis of Carbazole Dendrimer with Doublet-Excited Luminescent Radical as Core

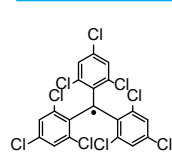
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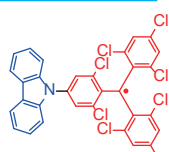
Improving exciton utilization efficiency is critical issue for luminescent molecules to realize high performance OLEDs. Recently, it was reported that doublet state emission of radical illuminants caused by the unpaired electron can realize 100% exciton utilization efficiency in OLEDs. However, luminescent radical materials suffer from low quantum efficiency and poor stability. Thus, D-A $\cdot$  structure provided an approach to improve the performance of radical. For example, with the introduction of donor unit, photo-luminescent quantum yield (PLQY) of tris(trichlorophenyl)-methyl (TTM) was increased dramatically from 2.6% to 53% in 1Cz-TTM with well improved stability<sup>1</sup>.

In this research, a dendrimer design strategy is introduced to construct a stable radical molecule based on luminescent radical core. It was considered that the bulky Cz dendron outer layer would provide a steric protection to the radical core and spin density would be delocalized with the extension of  $\pi$ -conjugation, so that the radical would be well stabilized. In addition, dendrimerization will give excellent film forming property and suppress aggregation caused quenching (ACQ) that will allow solution processed fabrication of OLEDs.

## Radical Molecule Structure

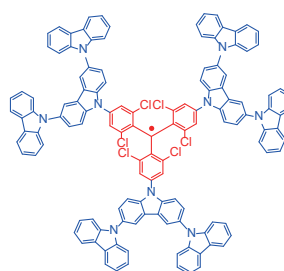


TTM  
Radical monomer  
PLQY=2.6%



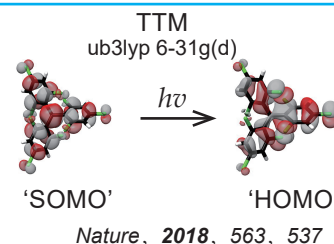
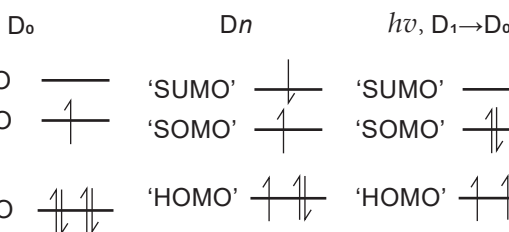
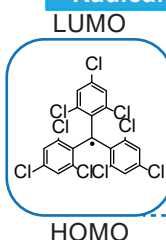
1Cz-TTM  
D-A $\cdot$  type excimer  
PLQY=53%

- D-A $\cdot$  charge transfer
- Increased PLQY
- Improved stability

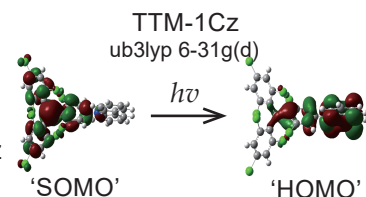
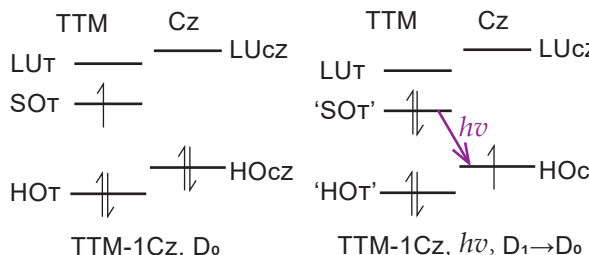
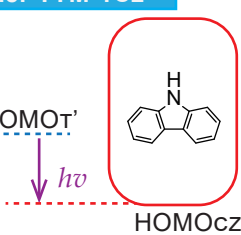
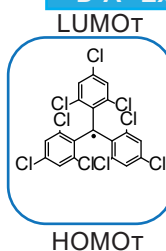


- CzG2TTM  
D-A $\cdot$  type dendrimer
- Steric protection of bulky dendron to radical core
  - Charge delocalization
  - Suppressed ACQ
  - Film forming property for solution processing

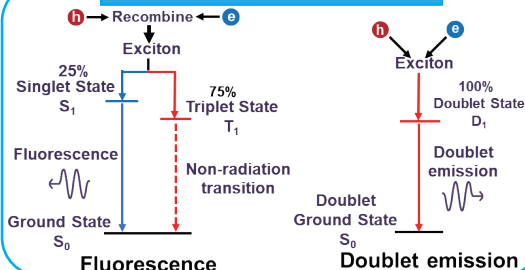
## Radical Monomer TTM



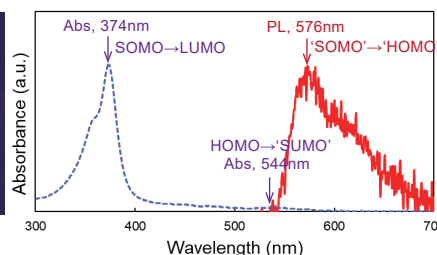
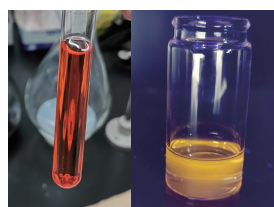
## D-A $\cdot$ Excimer TTM-1Cz



## Doublet Emission Mechanism



## PL and UV-vis of TTM



- Low stability: Emission quenched within 10min under UV irradiation
- Weak abs (544nm)  $\rightarrow$  weak emission (PLQY=2%)

