The Good, the Bad and the Ugly: the Role of Fluorine in the Design of Emissive Liquid Crystals

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Emissive liquid crystals (LCs) are highly useful materials for OLEDs, OFETs, solar cells, luminescent concentrators, etc. [1]. Unfortunately, their design is often less straightforward. Attaching alkoxy side chains to the dye core enables fluidity and nanosegregation via van der Waals interactions and thus promotes LC self-assembly. However, the strong donor properties of alkoxy groups often adversely affect the photophysical properties by changing HOMO / LUMO levels and orbital coefficients. Here, we demonstrate for two examples, i.e. merocyanines [2] and boron-based emitters displaying thermally activated delayed fluorescence (TADF) [3] (Figure 1), that attachment of semiperfluorinated side chains can flip the coin towards highly emissive LCs with broad, stable mesophases.

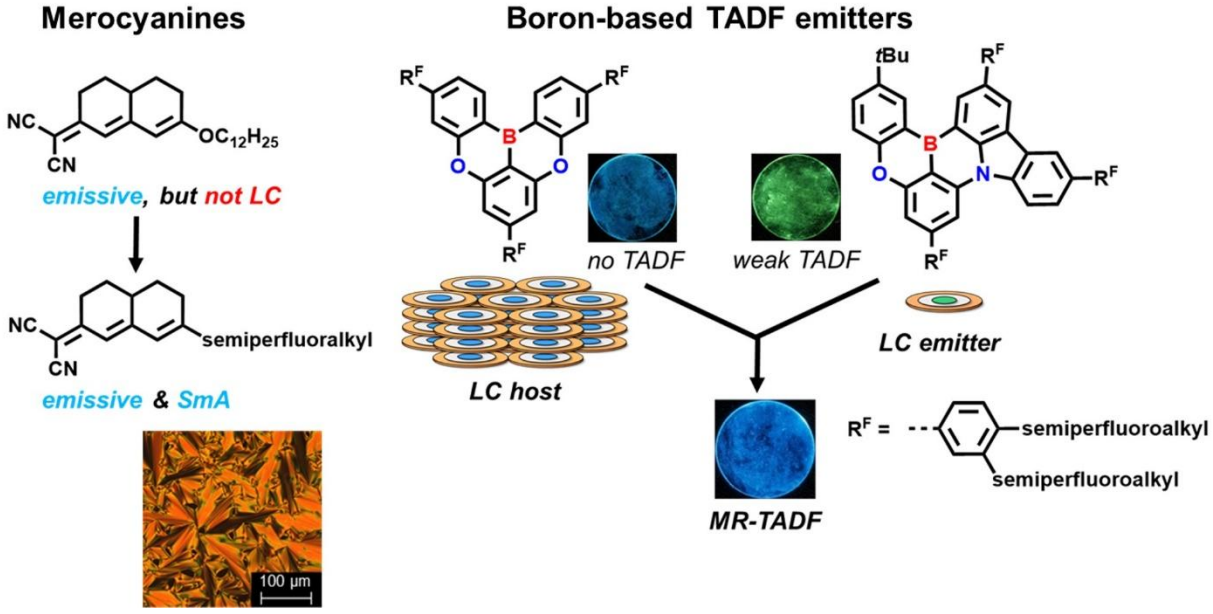

Figure 1. Semiperfluoroalkyl side chains enable strong emission and liquid crystalline self-assembly in merocyanines and boron compounds (MR-TADF = multi-resonant thermally activated delayed fluorescence).

References

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