Thermally Activated Delayed Fluorescence and its Application for OLED

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Organic light emitting diodes (OLED) offer many advantages over conventional light sources, such as incandescent bulbs or fluorescent tubes, in quality and tunability of emission color, in large area fabrication on almost any surface, and in low power consumption. Applications such as flexible and ultrathin displays or window glass which turns to a desired color, will be possible. While the first OLEDs displayed low efficiency fluorescent emission which is inherently limited by the underlying physical principles, the second generation OLEDs used phosphorescent materials, enabling to reach the theoretical maximum efficiency of light emission. However, compared to fluorescent OLEDs, phosphorescent OLEDs require expensive metal complexes and their design possibilities are limited. As a third alternative, we have demonstrated, that the yet unexplored thermally activated delayed fluorescence (TADF)-based OLEDs can unite the benefits from both the phosphorescence- and the fluorescence-based OLEDs. After introducing the two generations of OLEDs, TADF will be explained. In particular, the strategy for molecular design and the first promising results will be detailed.