Molecular Design and Synthesis of Triplet Exciton Harvesters for Efficient Organic Light-Emitting Diodes

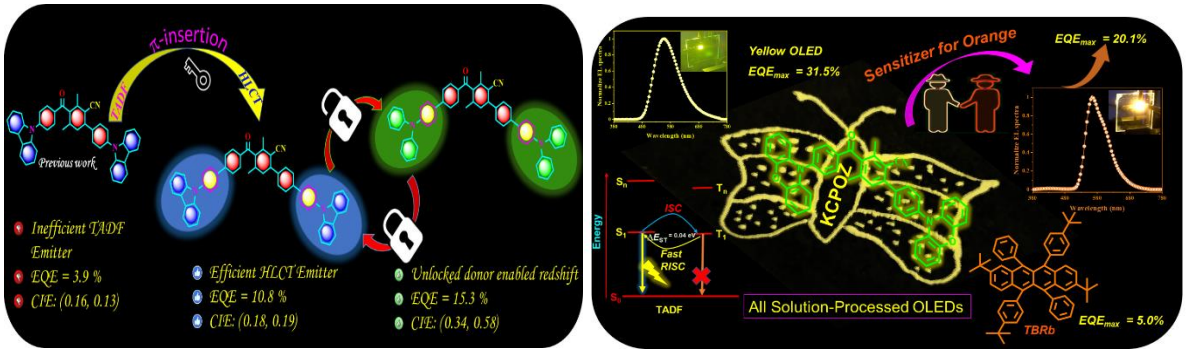
Sivakumar Vaidyanathan*

Department of Chemistry, Indian Institute of Technology Hyderabad,

Sangareddy, Kandi, Telangana-502285, India. **Email:* vsiva@chy.iith.ac.in

Abstract

Organic light-emitting diodes (OLEDs) have sparked significant interest in recent years due to their prospective applications in the next generation of flat-panel displays and solid-state lighting. Among the numerous design strategies of light emitting materials, hybrid-localized charge transfer (HLCT) and thermally activated delayed fluorescence (TADF) have emerged as promising new-generation OLED candidates due to their potential for 100% internal quantum efficiency via reverse intersystem crossing (RISC). One of the key parameters for the efficient RISC process is small singlet–triplet energy gap (ΔE_{ST}) with the aid of judicious molecular design. Developing efficient HLCT/TADF deep-blue and yellow emitters is critical for realizing full-color displays and white OLEDs. Especially, solution processed Organic light emitting diodes (OLEDs) with high external quantum efficiency and a long operational lifetime are still limited. In this context, we computationally designed and synthesized HLCT/AIE-HLCT/TADF emitters utilizing a new design strategy of twisted interlocked acceptor core integrated with different donors. The detailed photophysical, electrochemical, and Electroluminescent studies will be presented and discussed.



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