Title:	Room temperature perylene based columnar liquid crystals as solid-state fluorescent emitters in solution-processable organic light-emitting diodes
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Abstract:	The finding of pure organic emitter materials is the need of the hour for the mass production of cost-effective and metal-free fluorescent organic light-emitting diodes (FOLEDs). In this paper, we report a new series of perylene tetraesters (PTEs) that exhibit the room temperature columnar (Col) mesophase and can act as efficient fluorescent emitter materials in OLEDs. The molecular design involves the attachment of triazole moieties with the PTE discotic coreviaclick chemistry. Triazole groups were chosen as they can improve the electron transport as well as tune the luminescence behavior of discogens. All the PTE derivatives3a-dexhibited ordered columnar rectangular (Colro) mesophases at ambient temperatures suitable for various device applications. The electron mobility of perylene tetraester derivative3awas measured in the mesophase by time of flight (TOF) technique and found to be 0.014 cm2V−1s−1. However, the balanced hole and electron charge transport behaviour was observed in fabricated hole-only and electron-only devices. Taking advantage of both charge transport and the luminescence nature of the PTE derivative in OLEDs, a series of devices were fabricated by utilizing3aas a sole emitter and in the dispersed form at 1, 5 and 8 wt% with the CBP host and at 5 wt% in the SimCP2 host. A significantly high value of the external quantum efficiency (EQE) of 6.5% is obtained in doped devices with the CBP host at 5 wt% dopant (3a) concentration with CIE coordinates of (0.37, 0.53) corresponding to green color. The obtained high EQE value will certainly offer an important step forward to expand the application of smart DLC materials in OLEDs
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