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Title:	Solution-processable organic light-emitting diodes utilizing electroluminescent perylene tetraester-based columnar liquid crystals
Authors:	Dhingra, Shallu (/jspui/browse?type=author&value=Dhingra%2C+Shallu) Pal, Santanu Kumar (/jspui/browse?type=author&value=Pal%2C+Santanu+Kumar)
Keywords:	liquid crystals electroluminescent perylene tetraesters
Issue Date:	2022
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Citation:	Soft Matter, 18(46), 8850-8855
Abstract:	Herein, we reveal a homologous series of liquid crystals involving perylene tetraesters as the core connected to the four trialkoxyphenyl units at the periphery using the triazole moiety as the linker. A thorough analysis using differential scanning calorimetry, polarized optical microscopy, and small- and wide-angle X-ray scattering studies confirm that all the mesogens 1a–c hold a stable enantiotropic columnar mesophase. Suitable molecular orbital levels and excellent material photophysical and thermal properties encouraged the study of their electroluminescent properties. Due to this, a well designed solution-processable organic light emitting diode device structure is configured as ITO (125 nm)/poly(3,4-ethylenedioxythiophene):polystyrene sulfonate (PEDOT:PSS) (35 nm)/host: x wt% emitter (x = 0.5, 1.0, 3.0, 5.0) (20 nm)/2,2'-(1,3,5-benzinetriyl)tris(1-phenyl-1-H-benzimidazole) (TPBi) (40 nm)/lithium fluoride (LiF) (1 nm)/aluminium (Al) (200 nm) using compounds 1a–c as emitters. 4,4',4''-Tris[phenyl(m-tolyl)amino]triphenylamine (m-MTDATA) and 4,4'-bis(N-carbazolyl)-1,1'-biphenyl (CBP) were chosen as two different host materials. The current density–voltage–luminance and current efficacy–luminance–power efficacy plots suggest that m-MTDATA is a better host than CBP. Amongst, device based on 1 wt% emitter 1c doped in the m-MTDATA host matrix displayed the best performance, with a maximum power efficacy of 17.2 lm W <sup>-1</sup> , current efficacy of 18.5 cd A <sup>-1</sup> , and external quantum efficiency of 6.3%.
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