Title:	Self-assembled functional discotic liquid crystals for luminescence and efficient charge transport
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Abstract:	Discotic liquid crystals (DLCs) are a class of fascinating and promising self-assembled dynamic soft materials in recent times. Optical compensation film is the most significant commercial application of discotic nematic DLCs which is utilized to widen the viewing angle of liquid crystal display. In the columnar mesophase of DLCs, molecules are arranged in a particular direction along with the columnar stack and the charges can migrate through these aligned columnar channels. Thus, it can act as an organic semiconductor (OSC) in organic electronic devices such as organic field-effect transistors (OFETs), organic light-emitting diodes (OLEDs), and organic photovoltaics (OPVs). The flexible chains at its periphery attached to the central rigid core of DLCs not only facilitate low-cost solution processability but also control the morphology in the thin-film state. Besides, DLC materials provide an additional advantage in terms of flexibility, self-healing from defects, transparency, non- existence of grain boundaries, and its anisotropic properties which commend them a promising candidate for the development of efficient and economical organic electronics. This presentation will describe four examples of strategic design and synthesis of new DLCs for applications as an active component in OSC devices and emitters in OLEDs. The first example will address the rational design of columnar DLCs towards the attainment of efficient ambipolar charge transport systems with high hole and electron mobility. The tendency of homeotropic alignment of synthesized DLCs and their influence on charge transport is discussed in detail. 1 Second example will describe an aggregation-induced emission (AIE) active mechanoluminescent molecular design of tetraphenylethylene-cored DLCs which serve as an excellent yellow-green emitter in OLEDs and act as a highly selective probe for bio-imaging using HeLa cells. 2 Third example will unmask a new strategic increment of device performance of deep-blue OLEDs by employing a judicious design of fluorescent DLCs as the emitter. 3,4,5 Such systems also formed self-standing, luminescent and transparent π-driven supergels which can able to transport charges through its micrometer long networking channels. In the fourth approach, a unique strategy for the attainment of a discotic nematic mesophase is illustrated. Fundamental challenges and technological opportunities will be highlighted in each of these examples
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