Title:	Studies of the Mesomorphic and Electro-Optic Behaviour in Cholesterol-Based Bent-Shaped Mesogens
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Abstract:	Abstract Chirality holds a lot of importance in various branches of sciences such as optics, photonics, nanotechnology, drug delivery, pharmaceuticals, etc. The introduction of chirality in the molecular design of liquid crystals (LCs) has been found to stabilize several unusual self-assembled structures. Among them, the blue phase (BP) and twist grain boundary (TGB) phase are excellent examples of mesophases formed out of molecular frustration. BPs are being regarded as an emerging photonic material for potential applications in displays, switching, sensing, and other fields, whereas the TGB phase is known as the LC analogue of Abrikosov vortex lattice in type-II superconductors. However, insufficient thermal stability has curbed their practical applications. Therefore, this presentation will discuss the rational design of cholesterol-based bent-shaped liquid crystalline molecules for the stabilization of frustrated mesophases, electro-optical applications, and multi-stimuli responsive behavior. Moreover, this presentation will cover the development of non-symmetrical cholesterol-based dimers in the search for ferroelectric materials. Ferroelectric materials find applications in the field of information devices, electro-optical devices, switchable non-linear optics devices and light modulators as these materials can be rapidly switched between the two different states using an electric field. The first example will describe the development of cholesterol-based bent-shaped systems for the stabilization of the complex twist grain boundary (TGB) phase in a long temperature range. 1,3 Furthermore, thermochromic behavior and spontaneous formation of polar order in the orthogonal smectic phase exhibited by these bent-shaped mesogens will also be discussed. 1,3 The second example will cover a new family of chiral bent-shaped LC compounds that displayed remarkable stabilization of cubic blue phase in single-component systems. 2,3 Electro-optical performance and stimuli-responsive behavior will also be discussed. 2,3 The third example will exemplify the importance of the structure- property relationship where an increase in the number of rings on one side of the central bent-core led to the stabilization of the cubic blue phase in a long temperature range. 4 The fourth example will present non-symmetrical cholesterol-based bent-shaped dimers where the pro-mesogenic cholesterol moiety was tethered to the aromatic core via a flexible spacer leading to the formation of bent molecular architecture. 5 Several exotic mesophases formed by these dimeric systems such as chiral nematic, twist grain boundary, orthogonal smectic, and tilted smectic phase will also be discussed. 5 Ferroelectric properties and various other physical properties exhibited by these dimeric systems will be shown. 5 The fifth example will demonstrate a new family of non-symmetrical cholesterol-based that displayed 2D oblique mesophases. 6 This is one of the unique examples of non-symmetrical dimers where the molecules arrange themselves in an oblique lattice. 6 Key fundamental challenges and new technological opportunities will be highlighted in each of these examples.
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