

Chiral Phases in the Ferroelectric Nematic Realm

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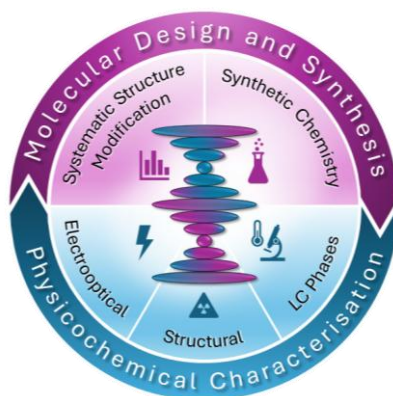
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Nematic LC-based technology is now vital to modern life, found in almost all LC displays. In the conventional N phase, the rod-like molecules all more-or-less line-up in the same direction but their positions are random. The molecules are not distinguished in terms of pointing up or down and so the phase is apolar. A new NLC phase was discovered in 2017, the ferroelectric nematic phase (N_F), in which the molecules are also distinguished by their direction and the phase is spontaneously polar. [1,2] The N_F phase exhibits remarkable electro-optical properties, has huge potential to revolutionise LC-based technologies, and is predicted to dominate LC science and technology for years to come. At the fundamental level, the recent surge in global research into the N_F phase has led to the discovery of several new polar LC phases. [3]

Molecular chirality drives the formation of the helical ferroelectric nematic phase (N_F^*). The combination of a helical structure and local electric polarity endows the resulting N_F^* phase with unique and exciting properties such as tuneable light reflection with minimal energy input, having application potential in new optical devices including adjustable lenses for virtual/augmented-reality headsets and versatile multi-wavelength lasers.[4] Research on N_F^* systems has largely focussed on mixing chiral additives with non-polar N_F materials. The outcomes are difficult to interpret at the molecular level due to the mixtures' complexity. To date only two single-component chiral materials have shown the N_F^* phase.[5] In the present work, we explore the synthesis and characterization of new chiral compounds designed to exhibit chiral analogues of the ferroelectric nematic phase and other polar phases in the 'ferroelectric nematic realm'.



References

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