Polar Order in Liquid Crystals

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Polar molecules are ubiquitous in our daily lives (e.g. water), possessing regions of positive and negative charges that generate a permanent electric dipole moment. While these dipoles are usually randomly oriented and cancel out in condensed phases, the ferroelectric nematic phase (NF) is an exception; the constituent molecular dipoles align parallel to each other, resulting in a bulk material that is polar. [1-7] In just a few years the NF phase has transitioned from being a curiosity found only in one or two materials (RM734, DIO), to being an established area of LC science.

The NF phase is just one example of a LC phase that exhibits polar order. In this talk, I will outline our ongoing work at the University of Leeds that focuses on new materials design and development allied to predictive simulations and calculations, the discovery of new polar phase types, and our development of room temperature NF materials.

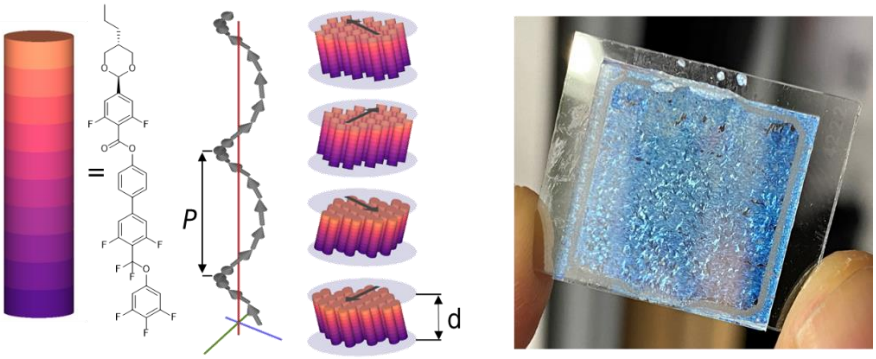

Fig. 1: Proposed structure of a helical polar smectic C variant discovered at the university of Leeds (left), which displays selective reflection (right) and operates at sub ambient temperature. [7]

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