Examining the material parameters of ferroelectric liquid crystal systems via the Landau potential

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Ferroelectric liquid crystals (FLC's) are ideal materials for studying the topics of phase transitions, chirality and chirality transfer due their diversity and ease of manipulation and handling. One of the best ways to probe the material parameters of an FLC is to measure its full Landau potential. The Landau potential describes the change of order parameter through a phase transition. The primary order parameter for FLC's is the tilt angle and the phase transition is the paraelectric smectic A* to ferroelectric smectic C* transition. The Landau potential can be utilised as a probe to quantify several key material parameters including the order of the phase transition and the chirality of a system.

Using an experimental method [1,2] it is possible to determine the full potential by use of the systems tilt angle and total polarisation. The method involves simultaneously fitting data taken with respect to applied electric field and temperature to the generalised Landau theory of FLC's [3,4]. This allows all of the coefficients of the Landau expansion to be determined on a quantitative basis.

The above method has been employed on FLC's of (i) varying order of phase transition [5] and ii) varying chirality [6]. The mechanism of chirality transfer has also been examined for FLC's doped with chiral and achiral dopants [7,8].

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