

ABSTRACT

The Effect of Electric Fields on Light Scattering of a mixture of two Chiral Nematic Liquid Crystals of the same Homologous Series

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Although chiral liquid crystals are very important to the physics community, they are not many direct techniques used to study them. Therefore in this thesis dynamic light scattering using back scattering geometry is used to investigate the behavior of the mixture of Cholesteryl Pelargonate and Cholesteryl Heptanoate as an electric field is applied. The light scattering technique involves the use of circularly polarized light and measures the amplitude of fluctuations in two of the five structural modes present in the isotropic phase of the sample. From these measurements, the second order transition temperatures for two of the five modes are then calculated. By varying the concentration of the two compounds their chirality varies without changing other material parameters significantly and the amount of blue phases present in each compound. The scattering intensity increases and decreases under the influence of the applied electric field. For certain concentrations the induced electric field affects the mode critical temperature $T_{\pm 2}$, the phase transition temperatures, the pitch of the compounds and the number of blue phases present in each compound as well as their stability. The effects of electric fields on the isotropic phase of liquid crystals of high chirality is a relatively unexplored area, so these measurements that show the effect and how it depends on chirality are of potential importance.

Keywords: Electric fields, structural modes, dynamic light scattering, blue phases, chirality and transition temperature