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Study of Physical Properties Associated with Some Binary Mixtures of Chiral Ferroelectric Liquid Crystalline Compounds

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Abstract: Among the various advanced technological materials in the modern era; Liquid Crystals (LCs) have become one of the most important self-organizing molecular materials with their growing applications in the various field of science. The research associated with the Ferroelectric Liquid Crystals (FLCs) has become a subject of most intense area during the past few decades owing to their valuable intrinsic fundamental properties. At present their successful utilization in flat television screens, fast electro-optical switching devices etc. makes them extremely demandable in the commercial field. The fulfilment of this promise depends greatly on an improved understanding on the physical properties of the FLC materials. However, no single materials can exhibit all the desired properties for different applications. In order to fulfil all the requirements of the device manufacturer; preparation of suitable binary mixtures is one of the most simple and elegant way in the field of LC Research. Keeping this in mind some mixtures have prepared by using pure chiral FLC compounds and investigated in the light of the static dielectric permittivity (ε), dielectric anisotropy (Δε), spontaneous polarization (P_s), response time (τ), torsional bulk viscosity (η) and dielectric spectroscopy. The temperature variation of P_s of the studied mixtures provides a preliminary idea about the order of the associated phase transitions namely SmA*-SmC* and N*-SmC*. The activation energy of all the mixtures have been determined from the best fitted Arrhenius plot. This assignment mainly contributes to the preparation and investigation of some smart multifunctional FLC mixtures aimed for optoelectronic and photonic applications.

Keywords: Static dielectric permittivity; Dielectric anisotropy; Spontaneous polarization; Critical exponent (β), Response time; Torsional bulk viscosity; Activation energy; Anchoring energy coefficient; Dielectric spectroscopy

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