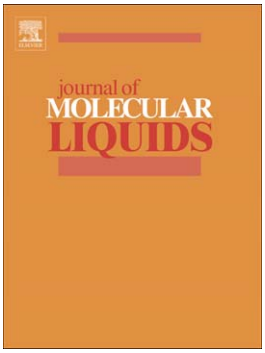

Negative optical anisotropic behaviour of two higher homologues of 5O. m series of liquid crystals

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Negative optical anisotropic behaviour of two higher homologues of 5O. m series of liquid crystals.

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ABSTRACT: In this paper, we report optical studies of two higher homologous of 5O. m (m=14, 16) series which are found to exhibit negative optical anisotropy in our studies. These compounds are calamatic interdigitated with unsymmetrical alkyl chain length. The compounds show high refractive indices in our experiment. The experimentally measured refractive indices data used to calculate the molecular polarizability, order parameter, Lorentz and internal field factors. We observed that, the molecular polarizability of both the sample increases with the increase in temperature. Vuks' and Neugebauer's models are adopted for the calculation of molecular polarizabilities. Direct extrapolation method for birefringence measurements and Vuks', Neugebaur's, modified Vuks' based on Haller's extrapolation methods were used to determine the order parameter of the LC compound. The results from our study show the same nature for both the liquid crystal compounds.

Keyword: refractive index, molecular polarizability, order parameter, anisotropy

1 Introduction:

Liquid crystals (LC) are intermediate phases between the fully ordered solid and disordered isotropic liquid. These partially ordered fluids exhibit spontaneous anisotropy with the dependence of temperature [1]. Due to anisotropy liquid crystals possess different optical properties that are important in technological applications. Molecular polarizability and order parameter of the LC samples are mainly determined from the refractive indices data. [2, 3, 4, 5, 6, 7, 8] .

Temperature dependence study of the molecular polarizability and the order parameter is important for understanding the anisotropy and the alignment of the LC sample. Liquid crystalline compounds exhibit two refractive indices, the ordinary n_o and extraordinary ne. The birefringence of the LC calculated as $\Delta n = n_e - n_o$. If $n_e > n_o$ then the liquid crystal is said to be positively birefringent and if ne < no then the LC is negatively birefringent [2, 3, 4, 9, 10, 11, 12, 13, 14]. Generally, most of the calamitic type LCs molecules exhibit positive birefringence. However, some calamitic LCs have also been reported to exhibit negative birefringence[15].

In this paper, we report that higher homologues 5O. m (m=14, 16) calamitic type of liquid crystal compound shows negative birefringence. We use experimentally measured refractive indices data can be used to obtain the molecular polarizabilities and order parameter values in different LC phases[16, 17].

Temperature dependence of molecular polarizability provides information on molecular conformation [18, 19]. Vuks' and Neugebauer's models have been used to investigate molecular