

DETERMINATION OF OPTICAL BIREFRINGENCE AND ORIENTATIONAL ORDER PARAMETER OF FOUR MEMBERS OF ALKYL CYANOBIPHENYLS USING HIGH RESOLUTION TEMPERATURE SCANNING TECHNIQUE

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ABSTRACT

We report the measurements of birefringence as a function of temperature of a homologous series of alkyl cyanobiphenyls (nCB) liquid crystalline compounds by means of high resolution optical transmission method. The temperature dependence of the birefringence (Δn) were determined from the transmitted intensity data for wavelength $\lambda = 532\text{nm}$. From the birefringence data, orientational order parameters ($\langle P_2 \rangle$) were determined using three parameter Haller's extrapolation technique. The order parameter critical exponents β obtained in this way have values < 0.2 , which do not match any of the predicted theoretical values. However, the critical exponent (β) obtained from Haller's extrapolation technique can be improved by using four-parameter fitting procedure, which yielded a higher value of β (-0.24), consistent with the mean-field theory for a weakly first order transition. Moreover, we have fitted our experimental order parameter values with those calculated from the Maier-Saupe theory for the nematic and McMillan's theory for the Sm A phase.

KEYWORDS: Critical Exponent, Cyanobiphenyls, Optical Birefringence, Orientational Order Parameter