

DTA and Dielectric Studies under Pressure of a Smectogen Substance with a Strong Perpendicular Dipole Moment

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The phase diagram of a substance with two CN groups attached to the benzene ring at lateral positions (CNCN) has been obtained with differential thermal analysis (DTA). The pressure range of the smectic A phase is limited, resulting in a triple point (Cr, S_A, L) at 135 MPa and 371 K. However, the S_A-phase exists also above the triple point as a metastable phase. The transverse relaxation times τ_{\perp} were obtained from the dielectric spectra measured for several isotherms as a function of pressure within the S_A-phase of CNCN. The activation volume, $\Delta^{\#}V_{\perp} = RT(\partial \ln \tau_{\perp}/\partial p)_T = (52 \pm 3) \text{ cm}^3/\text{mol}$ is larger than $\Delta^{\#}V_{\parallel}$, recently derived from the pressure dependence of the longitudinal relaxation times for other substances in the S_A-phase. It is concluded that due to steric hindrances made by the cyano groups the molecular rotations around the long axes become strongly slowed down by pressure and the smectic phase disappears

Key words: Liquid Crystals; Smectic A; DTA; Phase Diagram; Dielectric Relaxation; High Pressure.