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The Attenuation of the Ultrasound Wave for Smectic A—Solid Phase Transformation for Octyloxycyanobiphenyl

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THE ATTENUATION OF THE ULTRASOUND WAVE FOR SMECTIC A - SOLID PHASE TRANSITION FOR OCTYLOXYCYANOBIPHENYL

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Abstract The acoustical parameters anomalous behaviour near phase transitions in liquid crystals is considered. The local changes caused by ultrasound wave are leading to fluctuations of the order parameter. The behaviour of the attenuation acoustic wave for oriented sample of octyloxycyanobiphenyl near T^*_{SK} /from the smectic side/ was investigated. The increase of the attenuation near T^*_{SK} was observed. The attenuation was described by means of the critical exponents.

The attenuation of the ultrasound wave in the vicinity of smectic A - solid phase transition for octyloxycyanobiphenyl /S 326.95 K S_A 341.15K N 351.15 K I/ has been described. The measurements were performed by means high frequency ultrasound device US-6 in external magnetic field /B = 0.7 T/. Landau theory of phase transition has been applied. It was assumed, that the attenuation of the ultrasound wave in the vicinity of the phase transition may be descri-

bed in the form[1]:

$$\alpha = A \left(\frac{T - T^*_{SK}}{T^*_{SK}} \right)^{\lambda} \qquad 1$$

where: T^*_{SK} is a hypothetical temperature of second-order phase transition, λ - critical exponent and A - constant value. T^*_{SK}, λ and A have been determined numerically from experimental data. For example, the results for external magnetic field perpendicular to the propagation of wave direction, for frequency f = 5 MHz are as follows: A = 0.82 cm^{-1}, T^*_{SK} = 326.55 K and λ = -0.035. On the contrary, for the magnetic field parallel to the propagation of wave direction are substantial different, namely: A = 0.67 cm^{-1}, T^*_{SK} = 326.55 K and λ = -0.092.

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