Could phenomenological coefficients be extracted from detailed pitch measurements in AFLC

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The antiferroelectric liquid crystals are the common name for smectic liquid crystals formed of chiral molecules which form tilted polar phases (1). The SmC^*_α phase is helicoidally modulated with the period of few smectic layer thicknesses. It is only one phase in a temperature sequence of antiferroelectric liquid crystal phases. The commonly observed phase sequence upon cooling is SmA-SmC^*_α-SmC^*-SmC^*_{FI2}- SmC^*_{FI1}-SmC^*_A. A short description of discrete phenomenological model which is used for explanation of experimental observation in AFLC will be presented (2-3).

In the mixtures of two antiferroelectric liquid crystals the unique continuous pitch evolution in SmC^*_α phase was found. The detailed temperature dependence of the pitch was measured using resonant x-ray diffraction (4).

In this contribution we show that simple phenomenological model considering only bilinear interaction to nearest and next nearest layers can qualitatively well describe the measurements. However, if one considers biquadratic coupling to nearest layers as well, the perfect fit of the peach temperature dependence can be obtained. The detailed pitch measurements (4) allow for extraction of phenomenological model coefficients. The extracted phenomenological coefficients are in a very good agreement with considerations of the discrete phenomenological model of AFLC.

References

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