

Transformation of the antiferroelectric structure in electric field

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Transformation of the helical and unwound structure of antiferroelectric liquid crystal in electric field was studied theoretically. Calculations were performed in the framework of discrete phenomenological Landau model [1,2]. The field dependence of the helical pitch and the critical field E_C , at which the twisted structure transforms into the unwound structure, were calculated. The evolution of the structure with electric field differs essentially in antiferroelectric and ferroelectric liquid crystals. The antiferroelectric pitch changes slightly at small electric field and increases drastically at high field near E_C . The dependence of the critical unwinding field on model parameters, which describe interlayer interactions, has been studied. The electroclinic effect (change of the molecular tilt angle in electric field) was calculated. It was found that the electroclinic effect in the soliton state exceeds that in the unwound structure. Sign of the electroclinic effect in the soliton changes from layer to layer at low field and becomes negative in all layers in the metastable state of the soliton in high field. The peculiarities of the unwinding process in different chiral liquid crystal phases are discussed.

This work was supported in part by RFFI grants 08-02-00827, 09-02-00098 and by the Russian Science Support Foundation.

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