

Frustrated B_1 and antiferroelectric B_2 phases of bent-core thioesters studied by dielectric methods

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B phases of two banana-shaped homologues 1,3-phenylene bis{4-[(4-nonyloxybenzoyl)sulfanyl]benzoate (in short: 9OSOR) and 1,3-phenylene bis{4-[(4-dodecyloxybenzoyl)sulfanyl]benzoate (in short: 12OSOR) have been studied using electro-optic and dielectric methods. Polarizing microscopy allowed us to identify the B_1 phase for shorter homologue (9OSOR) and B_2 phase for 12OSOR. Spontaneous polarization measurements were carried out by reversal current method employing 1.7 and 3 μm AWAT HG ITO cells, for 9OSOR and 12OSOR, respectively. The current response of B_1 phase shows a kind of macroscopic polarization, whereas the B_2 phase occurs to be antiferroelectric one (two well separated peaks were observed) with large spontaneous polarization (Fig. 1). The polarization of phase B_1 is small and its temperature dependence is unusual as for ferroelectric liquid crystals, i.e. it increases with temperature.

Dielectric measurements were done using a dielectric spectrometer based on Agilent 4294A impedance analyzer. The samples were put into 5 μm AWAT HG cells with gold electrodes. The dielectric spectra measured vs. temperature for 12OSOR without bias field show two relaxation processes: one in the high temperature range (I) - connected with molecular reorientation around short axis - and the other at low temperatures (II) - related the reorientation around long axis. A complex relaxation process is also observed in dielectric spectra acquired under bias field: in the low frequency range the relaxation process is connected with fluctuations of domains, whereas at MHz frequencies there is a molecular process. Dielectric spectra for 9OSOR obtained with and without bias field showed only one process originating from the reorientation around the long molecular axis. Collective and molecular dynamics of the B_1 and B_2 phases will be discussed.

References

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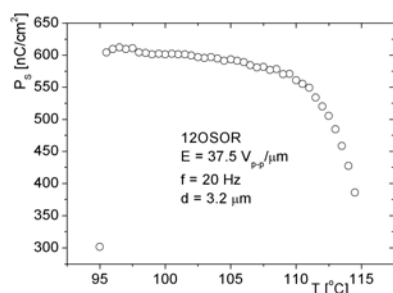


Fig. 1. Spontaneous polarization vs. temperature for 12OSOR

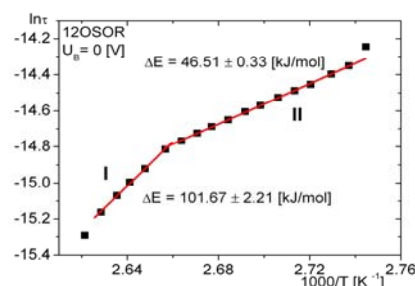


Fig. 2. Arrhenius plot for the dielectric relaxation processes observed without bias field