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NATURE OF ISOTROPIC-ISOTROPIC PHASE TRANSITION IN SIDE-CHAIN LC POLYMERS

An effective method for studying the orientational short-range order in the isotropic phase is electrical birefringence, or the Kerr effect. The method makes it possible to detect very small changes in the short-range order, which can not be observed with the use of classic means of studying. A few years ago, in the isotropic melt of methacrylic polymer with chiral side groups we found abrupt change of Kerr constant K which was attribute to the isotropic-isotropic transition[1]. This result was confirmed by calorimetry and x-ray investigations. In a number of works using methods calorimetry[2,3,4] and dielectric spectroscopy[5] was established the existence of transitions in the isotropic melts of low molecular weight liquid crystals. It is noteworthy that in all cases, the transition was implemented only in chiral smectic molecular systems. Therefore the question arose as to whether the chirality or the smectic order is mandatory for such transitions. In this work, the isotropic melts of four fractions of non-chiral acrylic comb-like polymers with mesogenic alkylcyanobiphenyl side groups[6] was investigated. Polymer fractions had nematic or smectic mesomorphism. As result, attributes of isotropic-isotropic phase transition was detected in all cases.

The short-range orientational order in the isotropic melts of comb-shaped polymers is due mainly to the presence of side groups, in this case alkylcyanobiphenyls. Therefore, the next step of our work was investigation the electro-optical properties of melts of six homologues of the alkylcyanobiphenyls series. It was found that the transition is clearly expressed in smectic substances, both low-molecular and polymeric. This is in good agreement with the assumption that the cause of such effect is the transition between an isotropic phase with a short-range orientational order and an isotropic phase with a short-range orientation and coordination order.

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