VIBRATIONAL SPECTRA OF CHIRAL SMECTIC LIQUID CRYSTALS DIFFERING IN THE MOLECULAR AND HELICAL STRUCTURE

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Liquid crystalline molecules with chiral center (for instance asymmetric carbon atom) form the macroscopic helical structure, which is characterized by two parameters: the helical pitch and the helical twist sense. The first parameter depends on temperature and may increase or decrease with temperature or increase for lower temperatures and decrease for higher temperatures in the chiral smectic phase with antiferroelectric properties (SmCA*) [1,2]. The second parameter may change for the same substance during the transition between liquid crystalline phases or within one phase. This phenomenon may be explained by existence of different conformers with opposite handedness, which concentration may change with temperature [3]. Fourier infrared and Raman spectroscopy are widely used in the analysis of structures of liquid crystal compounds. These methods also involve the confirmation of the existence of different conformers. The analysis of IR spectra allows to recognize the conformational changes during phase transitions [4,5].

In this work the chiral liquid crystalline esters with three-ring rigid core were examined. The infrared and Raman spectra analyses were performed for series of such compounds differing in the structure (type of chiral center, length of non-chiral chain and substitution of phenyl ring by fluorine atoms). The influence of molecular structure on values of helical pitch in SmCA*, type of handedness of helical structure and shifts of signals in the vibrational spectra were determined. The change of the length of non-chiral terminal chain has the most significant influence on the temperature dependence of helical pitch.