Molecular and intra molecular motions in nematic liquid crystals, at extra low temperatures, observed by means of dielectric spectroscopy

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Dielectric spectroscopy is one of the most important techniques in investigation of liquid crystals. It allows us to examine dielectric properties of a medium in cooling and heating process through all phases. In laboratory at Military University of Technology it is possible to measure electric permittivity in wide frequency (100 Hz ÷ 10 MHz) and temperature range (+200°C ÷ –100°C). Cell with gold electrodes is put in polystyrene chamber in darkness and cooled by dry ice and/or liquid nitrogen.

New Synthesized nematic liquid crystals included dual frequency nematic liquid crystals [1,2] were examined by dielectric spectroscopy in cooling process from isotropic phase to extra low temperatures. All investigated mixtures have a wide nematic phase. Crystallization temperature is below –70°C. At low temperature it can be noticed intra-molecular motions (which are normally observed at room temperatures using THz spectroscopy) because molecular orientation around long and short axis is frozen [3,4]. Such a wide temperature it allows us to observe how molecular relaxations change with decreasing temperature. In measurements of dual frequency liquid crystals is observed a second type of cross-over frequency [5]. At this frequency medium is switched from negative dielectric anisotropy to positive dielectric anisotropy.

References:

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