

Liquid Crystal Elastomers with Local Oblate Conformation

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Cholesteric liquid crystal elastomers (CLCE) are of special interest because of their optical properties, which can be used in diverse devices such as refractive displays or optical filters. In side-chain systems the director of the mesogen couples to the chain conformation and vice versa. It is well known that the local orientation between the polymer backbone and the mesogenic groups in nematic polymers depends on the number of atoms in the side-group spacer and is called odd-even effect (1).

CLCEs were obtained in thin films both for a prolate (odd number of atoms in the spacer) and oblate (even number) polymer chain conformation. Locally prolate systems with five atoms in the spacer were investigated by Kim et al. (2). Kniesel obtained polymer networks based on mesogens with a four-atom spacer which led to a locally oblate conformation (3). However, not all mesogens were aligned perpendicular to the polymer chain due to β -addition during the polyaddition reaction (4).

Our aim was to create polymer systems with a locally oblate conformation via a six-atom spacer. To prevent crystallization (5) several new mesogens with steric hindrances in the side groups were synthesized. Depending on the chemical structure of the mesogens, formation of different types of liquid crystalline phases was observed.

So far, only the biaxial extension of the films perpendicular to the cholesteric helix was investigated in details (2-3). We present a modified orientation technique for cholesteric elastomers with a locally oblate chain conformation and their mechanical properties under uniaxial deformation along the helicoidal structure. Furthermore we investigate the optical properties of these systems and their behaviour under mechanical deformation.

References

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Figure 1: Scheme of Cholesteric Elastomer.

