Polymer dispersed liquid crystal films with conical boundary conditions for electrically controllable polarizers

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Polymer dispersed liquid crystals (PDLC) are the polymer film with liquid crystal droplets dispersed in it. Optical properties of such films determined by the orientational structure in droplets can be controlled by the electric filed [1]. At the conical anchoring with the tilt angle of the director to the surface normal of 40°, the axial-bipolar orientational structure is formed in the droplets (Fig. 1a) [2]. Under electric field ***E*** these droplets are oriented by the bipolar axes along the field. At that, the control voltages are lower than in the case of bipolar structure.

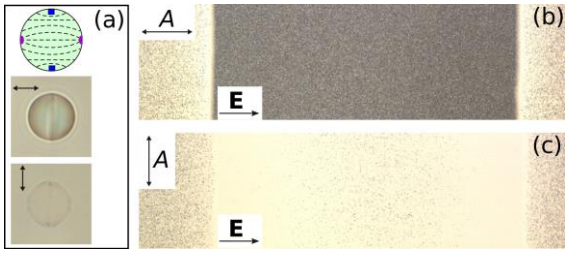

Figure 1. Scheme and microphotos of nematic droplet with axial-bipolar structure (a). Photos of PDLC film containing axial-bipolar droplets oriented by electric field when analyzer (*A*) is parallel (b) and orthogonal (c) to the field ***E***.

In present paper a transmission of polarized light by PDLC films with axial-bipolar droplets have been studied. Such a nematic droplet reveals a high scattering anisotropy for the light polarized along and perpendicularly to the bipolar axis even without electric field (Fig. 1a). The bipolar droplet axes disordered in initial state are oriented along the electric filed applied in the film plane. As a result, a polarizing-sensitive transmission of the PDLC films arises [2]. The films under study are characterized by high value of transmittance 89% for the light polarized perpendicularly to the applied electric field and high extinction ratio 590:1 at the low electric fields 0.34 V/μm.

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