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Research on the Optical Properties and Polymerization Environment of Broadband Reflective Films in the Visible Region

Authors : Z. Miao, Y. Chu, Y. Zhang

Abstract : The unique cholesteric phase liquid crystals obtained by mixing nematic liquid crystals with chiral dopants have gained valuable applications in the display field for their selective reflection and circular dichroism properties. The periodic arrangement of the helical structure of cholesteric liquid crystals makes it possible to produce Bragg reflection of circularly polarized light irradiated perpendicularly to the liquid crystals and, therefore, to acquire semi- or fully reflective surfaces or films. If the polymer-liquid crystal composites are combined with polymeric monomers, commercialized reflective broadband films can be fabricated. In this study, the polymer-liquid crystal composites reflecting visible light region (wavelength centered at 550 nm) were studied to analyze the effects of AC electric field at different voltages and frequencies on the optical texture of the composites, as well as the effects of polymerization temperature and ultraviolet (UV) intensity on the polymerization reaction and reflection bandwidth. The optimal sample was finally obtained at 100Hz, 120V, 30℃, 1.00 mW/cm², which provides a research suggestion to solve the influencing factors of visible light reflection bandwidths.

Keywords : cholesteric liquid crystal, reflection bandwidths, negative dielectric anisotropy, planar texture
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