

Synthesis and Characterization of Chiral Dopant Based on Schiff's Base Structure

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Abstract : CLCs (Cholesteric liquid crystals) draw tremendous interest due to their potential in various applications such as cholesteric color filters in LCD devices. CLC possesses helical molecular orientation which is induced by a chiral dopant molecules mixed with nematic liquid crystals. The efficiency of a chiral dopant is quantified by the HTP (helical twisting power). In this work, we designed and synthesized a series of new chiral dopants having a Schiff's base imine structure with different alkyl chain lengths (butyl, hexyl and octyl) from chiral naphthyl amine by two-step reaction. The structures of new chiral dopants were confirmed by ¹H-NMR and IR spectroscopy. The properties were investigated by DSC (differential scanning calorimetry calorimetry), POM (polarized optical microscopy) and UV-Vis spectrophotometer. These solid state chiral dopants showed excellent solubility in nematic LC (MLC-6845-000) higher than 17wt%. We prepared the CLC(Cholesteric Liquid Crystal) cell by mixing nematic LC (MLC-6845-000) with different concentrations of chiral dopants and injecting into the sandwich cell of 5μm cell gap with antiparallel alignment. The cholesteric liquid crystal phase was confirmed from POM, in which all the samples showed planar phase, a typical phase of the cholesteric liquid crystals. The HTP (helical twisting power) is one of the most important properties of CLC. We measured the HTP values from the UV-Vis transmittance spectra of CLC cells with varies chiral dopant concentration. The HTP values with different alkyl chains are as follows: butyl chiral dopant=29.8μm-1; hexyl chiral dopant= 31.8μm-1; octyl chiral dopant=27.7μm-1. We obtained the red, green and blue reflection color from CLC cells, which can be used as color filters in LCDs applications.

Keywords : cholesteric liquid crystal, color filter, display, HTP

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