Electro-Optic Effects of an In-plane Switching Cholesteric LCD

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Abstract

We have investigated electro-optical properties of an in-plane switching cholesteric liquid crystal display (LCD). Planar and focal-conic texture changes re induced by application of an in-plane electric field.

1. Objectives and Background

Recently, cholesteric liquid crystal (ChLC) displays have drawn lots of interest from liquid crystal industry because of their many promising applications [1]. Unlike conventional nematic LCDs, the ChLC displays do not require polarizers and color filters. It is known that planar and focal-conic states are stable in ChLC cells in the absence of the electric field. When the ChLC is in the planar state, the helical axis is normal to the substrates and the liquid crystal selectively reflects light incident on the ChLC cell. In focal-conic state, randomness of helix axes of ChLC scatters light, resulting in dark state using black background in reflective mode. To date, general modes used at ChLCD are PSCT (polymer stabilized cholesteric texture), PDLC (polymer dispersed liquid crystal) and SSCT (surface stabilized cholesteric texture) [1-5].

To improve the viewing angle in large-size LCDs, the in-plane switching (IPS) mode has been used [6,7,8]. The electric field applied in the plane of substrates switches liquid crystal directors to be in-plane.

In this paper we utilize an in-plane switching in the cholesteric liquid crystal displays. Better electro-optical properties such as gray-scale memory are reported

2. Experiments

ChLC mixture used in this experiment was a mixture of ZLI-6000-100 (Merck, n_o=1.5082, n_e=1.6589) and chiral additive S-811 (Merck Co.). The liquid crystal blended with chiral additive (27.5wt%) appeared green color about 543.5nm on peak in planar states.

To apply in-plane electric field, we devised a comb-shaped ITO pattern on glass substrates as shown in Fig. 1(a). Further, glass substrates coated with ITO(Indium Tin Oxide) were treated with Nylon6/6 and rubbed using velvet cloth to induce homogeneous alignment.

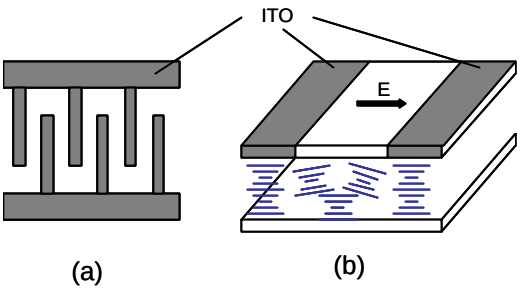

FIG. 1 Schematic of (a) interdigital electrode and (b) IPS ChLCD cell. Alignment layers on both substrates are not shown in (b).

3. Results

Figure 2 shows a preliminary result obtained from the IPS ChLCD cell. Detailed analysis and further experiment is under study.

4. References

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