Investigation of Polymer Wall Structure Influence on Electro-optical Properties of Flexible Cholesteric LCDs

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Cholestric liquid crystal (Ch-LC) devices based on plastic substrates are of great interest due to their potential advantages, such as thin profiles, color realization without color filters and robust display systems [1]. Some related works have been done such as the color realization [2-5] and pixel separation techniques [6-8]. In our previous work, we developed a high performance full color flexible Ch-LCD with single LC mixture and layer using PSCD based on the polymer wall formation method [8]. Two step UV exposure method was proposed: 1st-step for polymer wall formation and 2nd-step for color rendering. It proved to be mechanically stable which is applicable to flexible LCD.

In this work, we investigated the influence of polymer walls on the electro-optical properties of this sinlge layer flexible Ch-LC cell. We made the single layer Ch-LC using the Ch-LC doped with PSCD, and then compared the properties of the cells with and without the polymer walls.

Figure 1 (a) shows the POM image under crossed polarizers of the cell after driven to focal conic state. The polymer walls were clearly formed resulting in the perfect mechanical stability. Figure 1(b) shows the transmittance spectra for Ch-LC cell of the focal conic state with and without the polymer walls compared to that of homeotropic state. The average transmittance was 87.6% for homeotropic state, 80.2% for focal conic state with polymer walls, and 77.4% for the one without polymer walls. It can be analyzed that the focal conic state was much more stabilized as compared to that witout walls, so that the portion of planar alignment in focal conic state was reduced. Figure 1 (c) shows the reflectance vs. Applied voltage curve for the cell with and without the polymer walls. The focal conic range was broadened due to the polymer walls and networks. Becasue of the memory mode of transmissive and reflective states, this flexible Ch-LCD is suitable for the application to the transparent and reflective flexible displays, which has been of great interest recently.

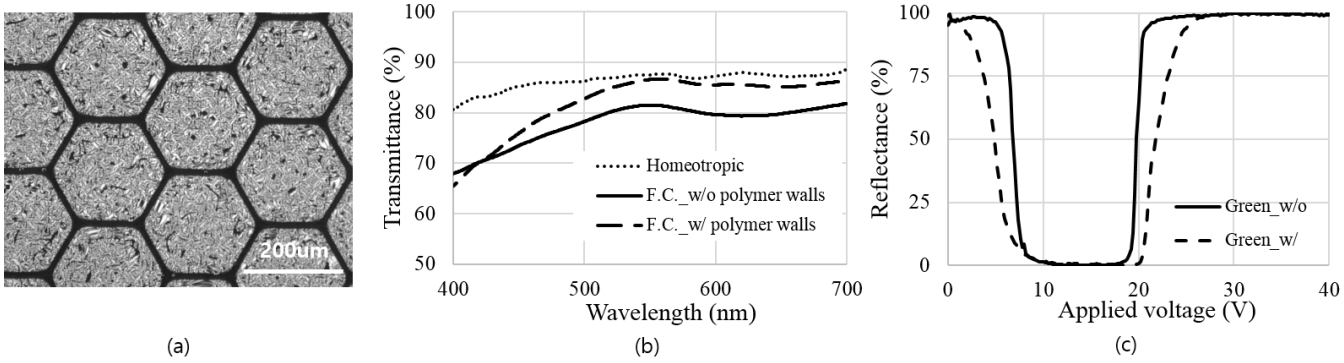

Fig. 1 (a) POM image and (b) transmittance spectra of cell after driven to focal conic; (c) reflectance vs. applied voltage curve of the flexible Ch-LCD cell

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