Polymer Stabilized Blue Phase Liquid Crystal Display with Low Operation Voltage and High Optical Transmittance

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Polymer-stabilized blue phase liquid crystal (PS-BPLC) display is one of the promising candidates for the next generation displays due to its superior characteristics, such as fast response time in sub-millisecond range, wide and symmetric viewing angle, and no aligning process [1]. However, the high operating voltage and the low transmittance in the PS-BPLC display should be overcome for widespread applications. Several electrode structures based on the interdigitated electrodes have been introduced to achieve the low operating voltage and the high transmittance. For example, the PS-BPLC displays with the partitioned wall-shaped electrodes [2], the protrusion electrodes [3], and the periodic corrugated electrodes [4] were proposed. Although the operating voltage was slightly reduced in those electrode structures, it was difficult to apply such electrode structures to the mass-production processes due to those complicated fabrications and assembling problems.

In this work, we propose the PS-BPLC display mode driven by the modified in-plane field by the interdigitated pixel electrodes on a bottom substrate and the patterned common electrodes on a top one. The bipolar electric fields were applied to two adjacent pixel electrodes grounded at the patterned common electrode placed at a centre of two pixel electrodes. In such configuration, the strong horizontal electric field could deeply penetrate the BPLC layer, which produced the large Kerr effect. As a result, we obtained the PS-BPLC display mode with the low operating voltage and the high optical transmittance without any complicated fabrication processes.

References

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