Alignment Stability of Uniformly Lying Helix Mode by Controlling Pretilt Angle

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Liquid crystal displays (LCDs) have been widely used from small mobile applications to large television applications. The fast response time in the LCD is still challenge. Recently, uniformly lying helix (ULH) mode was considered as one of the candidates with fast response time and wide-viewing angle [1]. However, the ULH mode have difficulty to obtain stable uniform alignment. To avoid random arrangement of the helical axis of the ULH mode, various alignment techniques such as periodic anchoring condition [2, 3] have been proposed but they were required complicated fabrication process.

In this work, we studied the alignment stablity of the ULH mode by controlling pretilt angle continuously. To control the pretilt angle, we stacked the vertical alignment layer onto the planar alignment layer [4]. In a chiral nematic LC mode, the Grandjean texture was observed in the planar alignment layer, on the other hand, the ULH texture was observed in the intermediate and vertical alignment layers as shown in Fig. 1. As a result, in the higher pretilt conditions, the better stable ULH texture was obtained. However, we found that the optic axis of the ULH texture was uncontrollable in the vertical alignment layer as shown in Fig. 1(c).

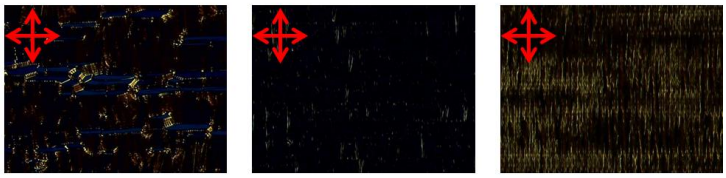

Fig. 1. The microscopic textures of the ULH modes with (a) planar, (b) intermediate, and (c) vertical alignment layers.

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