Alignment of uniformly lying helix mode by controlling of pretilt angle

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In the present decade, liquid crystal displays (LCD) have been the most commonly used in the field of display and many kinds of LC modes have been developed for high performances. Especially, uniformly lying helix (ULH) mode is one of the most potential LC modes, because it has wide viewing angle and fast characteristics [1]. However, it is very difficult to obtain a stable alignment of LCs and high driving voltages. Their helical axes are lying along substrates, as a result, the liquid crystals are not spontaneously aligned. To overcome this problem, many researchers have proposed new alignment methods like periodic anchoring condition [2, 3]. However, they need complicated manufacturing process.

In this paper, we discussed the alignment of ULH mode by controlling of pretilt angle. To controlling pretilt angles, we used the method of stacked alignment layers [4]. In ULH mode, because homeotropic and planar alignment are repeatedly appeared within very short pitch, the intermediate pretilt angle could provide the averaged effect for alternating surface condition between planar and homeotropic alignments. And, when LCs are injected into a cell, we applied electric field to induce ULH mode. Because of this surface condition and electric field, we can avoid grandjean texture caused by planar alignment layer and rotational symmetry caused by homeotropic alignment layer. We also discussed electro-optic characteristics.

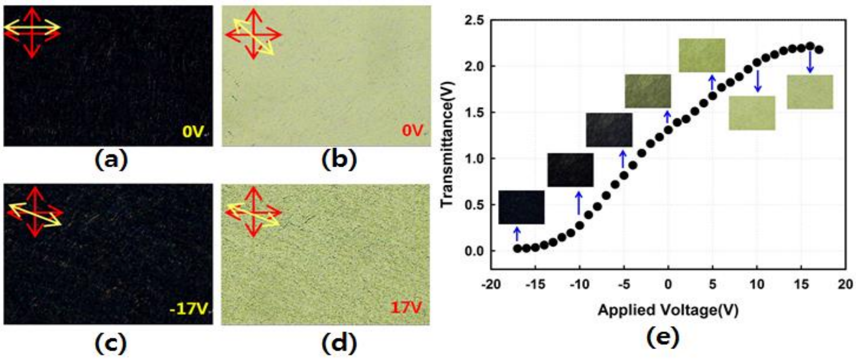

Fig 1. The microscopic textures of the cell with intermediated pretilt angle: (a) parallel, (b) rotated by 45° to the polarizer without electric field, (c) rotated by 22.5° to the polarizer under -17V, (d) +17V. (e) The measured voltage transmittance characteristics.

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