Two domain optically compensated bend mode using no-bias high pretilt angle configurations

Jung Ho Han[1], Soo In Jo[1], Chang-Jae Yu[1, 2] and Jae-Hoon Kim[1, 2]
[1]Dept. of Electronics and Computer Engineering, Hanyang University, Seoul 133-791, Korea
Tel.:82-2-2220-0343, E-mail: jhoon@hanyang.ac.kr
[2]Dept. of Information Display Engineering, Hanyang University, Seoul 133-791 Korea

Liquid crystal display (LCD) application such as television, mobile phone, tablet computer requires high performance liquid crystal displays with wide viewing angle and fast response time characteristics. In order to gain better performance, various approaches have been taken including rubbing of polymer films which is most popular and conventional process. However, owing to the fact that all the LC molecules are aligned uni-directionally over the whole panel area, a narrow and non-uniform viewing angular characteristic has limited the display performance. In order to overcome this shortcoming, many kinds of LC modes such as in-plane switching (IPS) [1], multi-domain vertical alignment (MVA) [2], and patterned vertical alignment (PVA) [3] have been developed for wide viewing angle characteristics using multi-domain alignment of LC molecules. However, previous LC modes are difficult to obtain the fast response time characteristics because when the electric field induced, diffrent flow direction of the LC molecules occur. Therefore, it is important to make a one-directional flow in LC cell and optically compensated bend mode (OCB) mode which has bend deformation of LC molecules can give one-directional flow which improves the response time characteristics [4]. In addition, unlike the conventional wide viewing angle LC modes with four-domain structures, OCB mode needs only two domains to obtain the symmetric viewing angle owing to self-compensation structure of the bend deformation.

In this study, we propose the two domain OCB mode to obtain the wide viewing angle and fast response time. To obtain the bend structure without bias, we use stacked alignment system to control the pretilt angle of the alignment layer [5]. And multi domain rubbing was performed by stamping-assisted rubbing process [6]. Finally, we could achieve the fast response and wide viewing angle LC devices

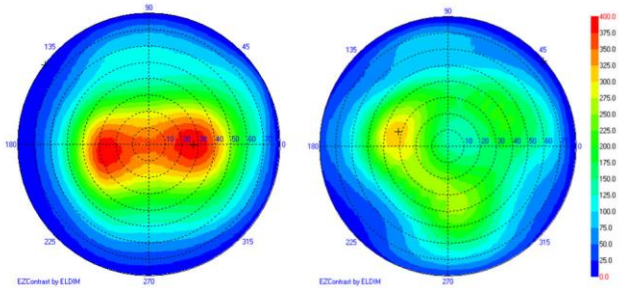

Fig. 1. Iso-contour contrast map of OCB measured by Eldim.; (a) one domain, (b) two domain

Acknowledgment

This research was supported by the IT R&D program of MKE/KEIT
(Grant No. 10041416, the core technology development of light and space adaptable new mode display for energy saving on 7 inch and 2W)

References

1. O. Masahito, and K. Kondo, *Appl. Phy. Lett.* **67**, 3895 (1995).
2. A. Takeda, S. Kataoka, T. Sasaki, H. Chida, H. Tsuda, K. Ohmuro, T. Sasabayashi, Y. Koike, and K. Okdamoto, *SID '98*, **29**, 1 (1998).
3. K. H. Kim, K. Lee, S. B. Park, J. K. Song, S. N. Kim, and J. H. Souk, *IDRC '98*, 383 (1998).
4. B. Philip. J, and R. Koehler, *Mol. Cryst. Liq. Cryst.* **133**, 329 (1984).

5. Y.-J. Lee, J. S. Gwag, Y.-K. Kim, S. I. Jo, S.-G. Kang, Y. R. Park, and J.-H. Kim, *Appl. Phys. Lett*. **94**, 041113 (2009).
6. J.-H. Na, Y.-T. Kim, J.-H. Hong, K.M. Koo, and S.-D. Lee, *SID Symposium Digest.* **41**, 1735 (2010)