Photoinduced In-situ Anchoring Transition from Random Planar to Uniform Planar using Photochromic Azo-Dye in a Nematic Liquid Crystal

Randhir Kumar Sinha[1], Sudarshan Kundu[1], Vineet Kumar[1], Myong-Hoon Lee[2], and Shin-Woong Kang[1]*
*Tel.:82-63-270-2847, *E-mail: swkang@jbnu.ac.kr*
[1]Department of BIN Convergence Technology, Chonbuk National University, Jeonju, Korea 561-756
[2]The Graduate School of Flexible and Printable Electronics, Chonbuk National University, Jeonju, Korea 561-756

Alignment of liquid crystal, can be controlled by the manipulating surface of the substrate adjacent to liquid crystal medium inside an electro-optic cell. It is well known that, the alignment of liquid crystal within two solid surfaces depends on the anchoring of the liquid crystal molecules to the solid surface in the absence of external factors such as electric or magnetic fields. The anchoring transitions in liquid crystal can give the information about the liquid crystal and solid surface interaction. The anchoring transitions caused by various external factors such as photoinduced conformational effect of *Trans*- and *Cis*-Azobenzes [1], temperature [2], light [3], polarized laser light [4], electric field [5], and material flow [6] have been reported previously.

In this present work, we report the anchoring transition from random planar to uniform planar by controlled illumination of linearly polarized UV-light. A very small amount of liquid crystalline azo-dye (0.1 ~ 0.3 wt%) has been mixed with a nematic liquid crystal of either positive or negative dielectric anisotropy. The ITO (Indium-Thin-Oxide) coated glass cells without any surface pre-treatment have been filled with the liquid crystal mixture. The cells have been exposed to linearly polarized UV-light at an elevated temperature in isotropic phase for 45 minutes at the intensity of 100 $\mu W/cm^2$. From optical and electro-optical characterization of the cell, we have confirmed that there is anchoring transition from a random planar to uniform planar. The resulting uniform planar state is stable against heat and visible light treatments. The approach to creating uniform planar alignment by such a non-contact as well as in in-situ condition can be immensely useful for display industry.

Acknowledgment

This research was supported by the Applied Materials Institute for BIN Fusion Convergence under “BK21 Plus Project” through the National Research Foundation of Korea funded by the Ministry of Education.

References

1. C. Ruslim, L. Komitov, Y. Matsuzawa, and K. Ichimura, *Jpn. J. Appl. Phys*., 39, L104 (2000).
2. L. Komitov, S. T. Lagerwall, A. Sparavigna, B. Stebler, and A. Strigazzi, *Mol. Cryst. Liq. Cryst*., 223, 197 (1992).
3. L. Komitov, K. Ichimura, and A. Strigazzi, *Liq. Cryst.*, 27, 51 (2000).
4. W. N. Gibbons, P. J. Shannon, S. –T. Sun, and B. J. Swetlin, *Nature*, 351, 49 (1991).
5. V. S. U. Fazio, and L. Komitov, *Europhys. Lett*., 46, 38 (1999).
6. V. S. U. Fazio, and L. Komitov, and S. T. Lagerwall, *Liq. Cryst.*, 24, 427 (1998).