Linearly polarized electroluminescence in a liquid crystalline conjugated polymer onto an alignment layer

Jin-Hyuk Choi,[1,3] Jeong-Gi Kim,[1,3] kyung-Min Beak,[1] Dong-Myung Lee,[1] You-Jin Lee,[1]
Chang-Jae Yu,[1,2] and Jae-Hoon Kim[1,2,*]

[1] *Department of Electronic Engineering, Hanyang University, Seoul 04763, South Korea*
[2] *Department of Information Display Engineering, Hanyang University, Seoul 04763, South Korea*
[3]*These authors contributed equally to this work*

[Contact E-mail: jhoon@hanynag.ac.kr]

Liquid crystalline conjugated polymer (LCCP) has attracted much attention in recent years since the optoelectronic performance could be easily enhanced by improving the molecular ordering of the LCCP. Especially, the linearly polarized electroluminescence (EL) is strongly affected by the orientational ordering of the LCCP, which is generally produced by a rubbing process of the alignment layer for the LC [1]. In general, the order parameters of the LCCP is gradually decreased along the bulk LCCP from the alignment surface [2]. As a result, the polarization ratio of the emitting light is strongly governed by the emitting zone within the LCCP in the EL process.

In our work, to investigate the effect of the LCCP ordering on the polarization ratio of the light emission, we varied a thickness of the alignment layer acting as a burden of a hole transportation. Poly(9,9-di-n-octylfluorenyl-2,7-diyl) (PFO from sigma aldrich) with a LC phase was used as an emitting layer for the linearly polarized EL and a polyimide AL22636 (from JSR) was used as the alignment layer. The polarization ratio of the EL was gradually increased with increasing the thickness of the alignment layer as shown in Fig. 1. As aforementioned, since the alignment layer acts as a burden of a hole transportation, the emitting zone in the EL process moves toward an anode within the LCCP. As a consequence, the order parameters of the LCCP is gradually increased and thus the polarization ratio is also increased in Fig. 1.

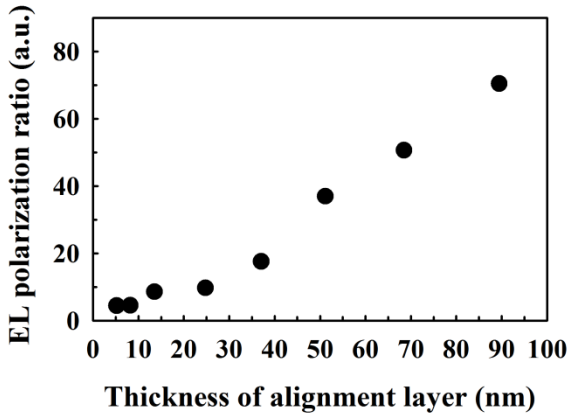

Fig. 1. Polarization ratios of the EL samples as function of a thickness of the alignment layer

Acknowledgement

This research was supported by the MOTIE(Ministry of Trade, Industry & Energy (project number 10052268) and KDRC(Korea Display Research Corporation).

References

[1] S. I. Jo *et al*., *Jpn. J. Appl. Phys.* **53**, 03CD04 (2014)
[2] A. A. Sonin, *The Surface Physics of Liquid Crystals* (Gordon and Breach Publisher, 1995).