# Study on Reverse Domains of Chiral Hybrid Alignment in In-Plane Switching Electrode

You-Jin Lee,[1] Soo In Jo,[1] Jae-Hoon Kim,[1,2] and Chang-Jae Yu[1,2,*]

*1 Department of Electronic Engineering, Hanyang University, Seoul, Republic of Korea*
*2 Department of Information Display Engineering, Hanyang University, Seoul, Republic of Korea*

Previously, we have proposed a liquid crystal (LC) display mode, namely chiral hybrid in-plane switching (CH-IPS) mode which has high transmittance and excellent dark state using the hybrid alignment of the nematic LC with a chiral dopant in the in-plane switching electrodes.[1] The chiral dopant gives rise to a normally white state due to a twisted nematic structure in the hybrid configuration. The in-plane field parallel to the planar alignment produces the unidirectional alignment and thus the dark state is obtained. However, the CH-IPS mode observed a reverse domain problem.[2]

In this work, we investigate the reverse domain formation in the CH-IPS mode in viewpoints of a pretilt angle and a surface anchoring energy for a planar alignment layer. From numerical calculation of free energy without an external field for various pretilt angles and various surface anchoring energies, we found that the high pretilt angle and the strong anchoring strength remove the reverse domains. Also, we experimentally confirmed effects of the pretilt angle and anchoring strength on the reverse domain formation.

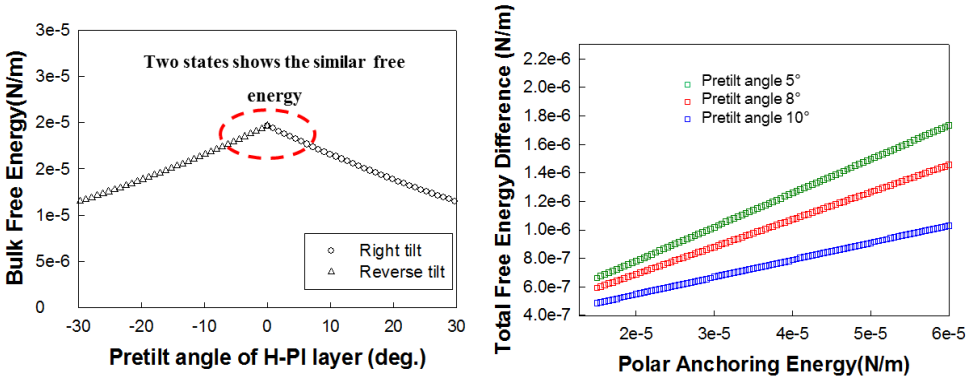


Figure 1. (a) Free energy of the chiral hybrid configuration as function of the pretilt angle and (b) free energy difference according to the pretilt angles as function of the polar anchoring energy under no applied voltage.

Acknowledgement
This research was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MEST) (2012R1A2A2A01046967), and a grant from Samsung Display Co., Ltd.

References:
[1] J. S. Gwag, K. Sohn, Y.-K. Kim, and J.-H. Kim, Opt. Exp. **16**: 12220 (2008).
[2] Y.-K. Kim, J. S. Gwag, J. Park, Y.-J. Lee, and J.-H. Kim, Mol. Cryst. Liq. Cryst. **508**: 236 (2009).

* corresponding author; E-mail: cjyu@hanyang.ac.kr