Effect of alignment properties on formation of uniformly lying helix texture

Chang-Jae Yu,[1,2,*] You-Jin Lee,[1] 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
*E-mail: cjyu@hanyang.ac.kr

The uniformly lying helix (ULH) structure in short-pitch cholesteric liquid crystals (CLCs) has been much interest in display applications because of its fast response time and continuous gray-level capability based on the flexoelectric effect [1,2]. However, since the standing helix (Grandjean) texture is energetically more stable than the ULH texture in planar alignment layer, various methods to obtain the stable ULH texture were proposed [3-6]. Most methods are unsuitable to apply a large scale device except for the twisted configuration [6]. In addition, little quantitative study of the formation of ULH texture according to alignment properties such as a pretilt angle and an anchoring energy has yet been explored.

We quantitatively investigated effects of the pretilt angle and the anchoring energy, which is applicable to the large scale device, on the formation of ULH texture by using spatially averaged reflectance [7]. Reflectance of the short-pitch CLC cell is mainly governed by selective reflection from the standing helix (Grandjean) texture while no reflectance is observed from the ULH texture. That is, the lower reflectance means that the ULH texture is formed over a larger area. From spatially averaged reflectance, we found that the higher pretilt angle and the weaker the anchoring energy, the better the ULH texture obtained. Also, better uniformity of the optic axis in ULH texture was achieved in the higher pretilt sample even at the same anchoring energy. Also, we discuss electrooptic properties of the ULH sample.

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References

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Speaker Biography

Chang-Jae Yu received his BS and MS degrees with an honor of Summa Cum Laude in physics from Sogang University, Seoul, Korea, in 1996 and 1998, respectively. He received his PhD degree in Electrical Engineering from Seoul National University, Seoul, Korea, in 2005. From 2006 to 2007, he joined Material Research Laboratory at University of Illinois at Urbana-Champaign, USA. Since 2007, he has been an Associate Professor in the Department of Electronic Engineering, Hanyang University, Seoul, Korea. Since 2016, he has served an associate editor for Optics Express in OSA. His main research interests include display and photonic devices using liquid crystals and organic light emitting materials.