Polar Anchoring Energy of PS-VA panel

Keunwoo Park, Nakcho Choi, Eunhee Han, Yeogeon Yoon, Namseok Roh

Display R&D Center, Samsung Display Co., Ltd., Giheoung-gu, Yongin-City, Gyeonggi-Do, 446-711, Korea
Tel.:82-31-8000-8254, E-mail: k-woo.park@samsung.com

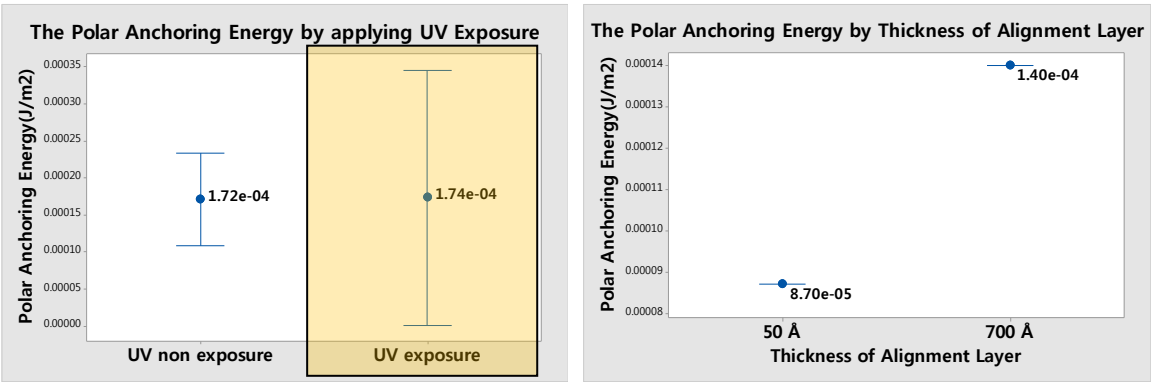
In Polymer-stabilized vertical alignment mode(PS-VA), the orientation of the Liquid Crystals**(LCs)** is a very important thing. To make 4 domains in the sub pixel in the PS-VA, the UV light is expossed to the panel that is filled with liquid crystals including reactive mesogens(RM). When there is no the UV exposure process, there is no pretilt angle of LC that is aligned vertically. On the other hand, when UV exposure is applied, LCs get to be a little tilt angle at the black state. As a result, LCs have a fast response time.

In this paper, we have measured the polar anchoirng energy in the PS-VA. We have carried out two experiments. One is about the relationship between the Polar anchoring energy and the UV exposure. The other is the Polar anchoring energy and thickness of the alignment layer. We measured the optical retardations**(R)** accoriding to various voltages for calculating the Polar anchoring energy. Then we have applied to characteristic values of the LC such as Elastic constant**(K)** and Dielectric constant**(ε)** on equation **[1]**. Finally, we can calculate the polar anchoring energy(**W, J/m^2**) from a slope of the equation **[1]**(d is a Cell gap of the cell.).

First, we compared the Polar anchoring energy of the UV exposured cell and the cell without UV process. The results were similar as **~10^{-4} J/m^2** for each samples**(Fig. 1(a))**. It means that there is no difference in the polar anchoring energy accrding to the UV process.

Next, we have measured the Polar anchoirng energy by thickness of the alignment layer. The measurement results are **~10-4 J/m2** in the thin alignment layer cell and **~10-5 J/m2** in the thick alignment layer cell **(Fig. 1(b))**. From the results, we have known that the Polar anchoring energy is influenced by thickness of the alignment layer.

$$\left(\frac{R}{R_o}-1\right)\times(V-V') = \left(\frac{2\times K_{33}}{W\times d}\right)\times(V-V') - A \quad \textbf{[1]}$$



(a) **(b)**

Fig. 1 Polar Anchoring Energy of Samples (a) The Polar Anchoirng Energy by applying UV Exposure, (b) The Polar Anchoring Energy by Thickness of Alignment Layer

References

1. Nie, X. et al. Polar Anchoring Energy Measurement of Vertically Aligned Liquid Crystal Cells. SID 05 Digest, P-126 (2005)
2. Yang, F. et al. Homeotropic polar anchoring energy of a nematic liquid crystal using the fully leaky waveguide technique. J.Appl. Phy., vol.88, 6175 (2000)