Study on Surface Anchoring Strength of Liquid Crystals on Treated Alignment Layer

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The alignment of liquid crystals (LCs) is very important due to fundamental understanding of the LC as well as electro-optical applications. The surface anchoring energy is one of the critical parameters in the LC alignment. In general, the anchoring energy function in Rapini-Papoular form is given by $W(\theta,\phi) = (1/2)W_\theta \sin^2\theta + (1/2)W_\phi \sin^2\phi$, where W_θ and W_ϕ are the corresponding polar and azimuthal anchoring strengths. The W_θ and W_ϕ are directly related to LC-surface interaction. To enhance anchoring strength, ion beam (IB) alignment [1] and polymer-sustained alignment (PSA) [2] have been reported. However, the primary issue related to IB alignment has instability of LC alignment, while the challenge facing the PSA is a UV stability and image sticking due to residual monomer. Recently, the new alignment using reactive mesogen (RM) mixed with vertical alignment layer are reported [3]. The method leads to fast switching patterned vertical alignment (PVA) display.

Here, we proposed a new alignment method using stacking RM on the alignment layer in the twisted nematic (TN) cell for improving anchoring strength. As increasing the concentration of the stacking RM layer, the polar and azimuthal anchoring energy is increased. The increased anchoring energy is leads to the reduction of 38% relaxation time, comparing to conventional TN cell. This enhancement of the anchoring strength is mainly originated from the strong molecular interaction between the LC and the oriented RM by the alignment layer. Also, we discuss the anisotropy of the treated surface in the view point of the anchoring strength.

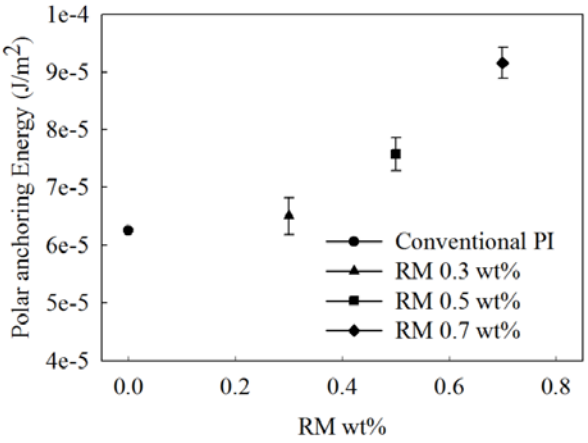

Figure 1. The measured polar anchoring energies as a function of RM concentrations.

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