Proceedings of the 3rd World Congress on Recent Advances in Nanotechnology (RAN'18)
Budapest, Hungary – April 10 - 12, 2018
Paper No. ICNNFC 126
DOI: 10.11159/icnnfc18.126

Automatic Vertical Alignment Layers by Phase-Separation of Polymerizable Amphiphilic Molecules from Liquid Crystal

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Extended Abstract

The synthesized dendritic amphiphilic molecules can be used for the construction of automatically vertical alignment (VA) layer of liquid crystal (LC) medium by inducing phase-separation from LC medium. Several dendritic amphiphilic molecules were introduced.[1-4] In this paper, the automatically VA layer on substrates is induced by the synthesized Itaconic acid-based dendritic amphiphile ($Ita3C_{12}$). However, the constructed VA layer is unstable and unsuitable to use in real LC display device because of low anchoring energy, slow response time, and narrow viewing angle.[3] Therefore, this system was applied in multi-domain electrode LC cell and was polymerized with small amount of and methacryl polyhedral oligomeric silsesquioxane (MAPOSS) to form robust layer by ultraviolet (UV) light under electric field to induce the pretilt angle. After polymerization in the multi-domain electrode cell, the electro-optic properties of the VA cell were dramatically improved because of polymer stability and pretilt angle.[4] Furthermore, to investigate the morphological and chemical properties on the substrate of polymer-stabilized VA electrode cell, X-ray photoelectron spectroscopy (XPS), atomic force microscopy (AFM), and scanning electron microscopy (SEM) were combined and utilized. Based on the morphological observations with surface chemical analyses, it was found that various sizes of protrusions on the solid substrates were automatically constructed by the two-step mechnisms.[4] The sizes of protrusions were determined by chemical affinity between monomers and substrates. We demonstrated the polymer-stabilized VA electrode cell with the enhancement of electro-optic properties as a single-step process and investigated how the protrusions were automatically developed during the polymer stabilization. This work was supported by the BRL 2015042417, MOTIE/KDRC 10051334, Mid-Career Researcher Program (2016R1A2B2011041), and NRF-2017 Global Ph.D. Fellowship Program (NRF-2017H 1A 2A 1045855).

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