The Stabilization of Liquid Crystal Mode on Flexible Substrates using Anisotropic Phase Separation of Liquid Crystal and Polymer Composite

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Abstract

In recent years, LC devices using plastic film substrates have drawn much attention for use in applications such as smart cards, PDA, and head mount displays because of their lighter weight, thinner packaging, flexibility, and lower manufacturing cost through continuous roll processing than other similar available devices . However, it is clear that plastic substrates can not give a solid mechanical support for the molecular alignment of LCs between them. To overcome these problems, polymer walls and/or networks as supporting structures have been proposed and demonstrated [1,2,3]. These structures were fabricated using an anisotropic phase separation method from polymer and LC composite systems by applying patterned electric field or spatially modulated UV intensity. However, these methods require high electric field to initiate the anisotropic phase separation or remain residual polymers in an unexposed region that reduce optical properties and increase the operating voltage of the device.

More recently, we proposed pixel-isolated LC (PILC) mode for fabricating a stable LC structure using anisotropic phase separation produced by contraction and surface wetting properties [4]. Since LC molecules are isolated in pixels surrounded by interpixel vertical polymer walls and horizontal polymer films on the upper substrate in the structure, it shows not only good mechanical stability but also almost the same optical behavior with respect to the normal mode without a polymer.

In fabrication of PILC, there occur two kinds of anisotropic phase separation. First, by applying UV irradiation through patterned photomask, spatially modulated polymer wall structure can be generated. And next, weak UV exposure can generate 1-dimensional anisotropic phase separation of remaining polymer and LC along the substrate normal direction which is called phase separated composite organic films (PSCOF). In PSCOF structure, although we use same kind of liquid and polymer mixture, the microscopic textures show very different textures as alignment materials are changed. Hence to obtain good quality of LC alignment, there is requirement on alignment layer material. We investigated the relation between LC alignment and wetting properties of polymers on alignment layer using glass substrates. By observing polarized microscope and scanning electron microscopic images, we could confirm that LC alignment property in PSCOF structure clearly related to surface properties of polymers. And finally we

could obtain good quality of stabilized liquid crystal mode using PILC without loss of alignment quality and electrooptic properties on plastic substrates.

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L5.21
Cathodoluminescence and Electroluminescence from Multi-layered Organic Structures Induced by Field Electron Emission from Carbon Nanotubes. Raquel Ovalle Robles[1,2], Alexander Kuznetov[1,2], Zakhidov Alexander[3], Christopher Williams[1,2], Mei Zhang[2], Sergey Lee[2], Jhon Ferraris[2] and Anvar Zakhidov[1,2]; [1]Physics, University of Texas at Dallas (UT-D), Richardson, Texas; [2]NanoTech, University of Texas at Dallas (UT-D), Richardson, Texas; [3]Physics, Moscow State University, Moscow, Russian Federation.

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Field Emission of Electrons from Transparent Carbon Nanotube Sheets. Alexander Kuznetsov[1], Alexander Zakhidov[2], Mei Zhang[1], Shaoli Fang[1], Sergey Lee[1], Ray Baughman[1] and Anvar Zakhidov[1]; [1]Nanotech. Institute, University of Texas at Dallas, Richardson, Texas; [2]Physics, Moscow State University, Moscow, Russian Federation.

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Patterning of Poly(3, 4-ethylenedioxythiophene)(PEDOT) thin films by using self-assembled monolayers(SAMs) patterns formed by ultra-Violet(UV) lithography Taewook Kwon[1], Jinyeol Kim[1], Myungmo Sung[2] and Jaegab Lee[1]; [1]School of Advanced Materials Eng., Kookmin Univ., Seoul, South Korea; [2]Department of Chemistry, Kookmin Univ., Seoul, South Korea.

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The Performance of Cu/Co Gate Electrode Formed Using Selective Deposition of Cu/Co Multilaters on Patterned SAMs for a-Si TFTs. Jeonggil Lee[1], Jaegab Lee[1], Changoh Jeong[2], Jehun Lee[2] and Yangho Bae[2]; [1]School of Advanced Materials Eng., Kookmin Univ., Seoul, South Korea; [2]Active Matrix Liquid Crystal Display Division, R&D team, Samsung Electronics Co., Ltd., Yongin, South Korea.

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Synthesis Of Zinc Sulfide Powder By Surfactant Assisted Hydrothermal Process Kiran Jain and Rashmi Rashmi; Electronic Materials Division, National Physical Laboratory, New Delhi, India, New Delhi, India.

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Effect of Silver Nanoparticles in the Hole Tranporting Layer on the Performance of Organic Light Emitting Diodes. Chang Seoul, Jin Heon Kim, Joon Ho Lee and Tae Hun Kim; Advanced Fiber Engineering, Inha University, Incheon, South Korea.

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Mechanical properties of ITO film on polymer treated by linear ion source Shih Hsiu Hsiao, Yoshikazu Tanaka and Ide-Ektessabi Ari; Mechanical Engineering and Science, Kyoto University, Kyoto, Japan.

L5.28
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