P63. Patterned Surface Effects on Ordering of Anisotropic Liquid Crystal Molecules

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We demonstrate an axially symmetric multi-domain liquid crystal (LC) structure regulated by patterned LC alignment layers. In our structure, a homeotropic LC alignment layer is periodically patterned on a homogeneous LC alignment layer. Before patterning, the homogeneous LC alignment layer is unidirectionally rubbed to generate pretilit in LC anchoring. The patterned homeotropic LC alignment layer is simply fabricated on the homogeneous LC alignment base layer by micromolding in capillaries (MIMIC) with a patterned elastomeric mold structure. After patterning, the patterned homeotropic LC alignment layer is not rubbed. With the MIMIC method, we prepared two patterned substrates, where the patterned materials and the patterned structures are identically formed, and the substrates are assembled for the rubbing direction of the homogeneous LC alignment base layer to be orthogonal to each other. Into the cavity, a nematic LC (NLC) with a negative dielectric anisotropy is filled in an isotropic phase of the NLC.

Our NLC cell has four domains in an absence of applied voltage. In the pixel areas, the NLC is vertically aligned (VA) without pretilt. At side of the pixels, the NLC is aligned with hybrid structures. Among them, the pretilt of two hybrid LC domains is determined by the rubbed homogeneous LC alignment layer of the lower substrate and the pretilt of others is determined by the rubbed homogeneous LC alignment layer of the top substrate. Therefore, the pretilt directions of two hybrid domains are orthogonal to each other. At corners, twisted nematic structures are identically formed. In this structure, the field-induced LC reorientation in the pixel area is determined by the pretilt direction of the boundary LC molecules with hybrid configuration since the LC molecules with hybrid structure respond at lower voltages than those with VA structure. Due to orthogonal boundary effects in pretilt, the textures in the pixel areas show axially symmetric multi-domain LC structure, resulting from the domain propagation effect from the pixel boundaries. In this presentation, distribution and redistribution phenomena of LC molecules by periodically patterned surface effects are demonstrated and discussed.

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Poster #	Presenting Author	Abstract Title
50	Lowrey, Sam	Multiple Bragg reflectors in natural and nanoengineered systems – inspiration from scarab beetles
51	Washburn, Kathryn	The Influence of wettability on pore-to-pore exchange
52	Madsen, Louis	Plasticization of Polymers in Fluid CO2 Measured by In situ NMR
53	Kennedy, John	Raman scattering of hydrogen and nitrogen ion implanted ZnO thin films
54	Richardson, Michael	Plasmon-induced photoelectrochemical devices on high surface-area substrates
55	Ren, Jintian	Synthesis and Spontaneous Superlattice Formation of Iron Nanocubes
56	Teng, Dayong	Rheological Properties and Alignment of Multi-Walled Carbon Nanotube in Polymer Matrix under Continuous Shear Force
57	Galloway, Christopher	Optical properties of 2-D photonic crystals for spectroscopy applications
58	Thountom, Sarawut	Phase evolution and electrical properties of thin lead zirconate titanate films prepared using a triol sol-gel route
59	Punyanitya, Sittiporn	Processing and Characterization of Novel Hemostatic Agent for Surgery from Thai Rice Starch
60	Edgar, Andrew	Size-related fluorescence from Eu^{2+} ions in barium chloride nanoparticles in fluorozirconate glass
61	Xia, James	The microstructure of metal-organic deposition $YBa_2Cu_3O7-\delta$ wires observed by TEM
62	Hilder, Matthias	Plasma CVD at Atmospheric Pressure: A Simpler Approach to Thin Film Depositions
63	Kim, Jae-Hoon	Patterned Surface Effects on Ordering of Anisotropic Liquid Crystal Molecules
64	Micolich, Adam	Superconductivity in Ion-beam Metal Mixed Polymers
65	Bernhardt, Harold	Transfer RNA building blocks for nanotechnology
66	Song, Ha-Chul	Synthesis of nanoparticles, nanowires, and nonocubes of copper oxides from layered organic-inorganic hybrid compounds
67	Bongkarn, Theerachai	Phase transitions of excess PbO-doped $(Pb_{0.975}Ba_{0.025})ZrO_3$ ceramics
68	Cruz-Irisson, Miguel	One-Dimensional Electronic States on the Silicon Carbide Nanocrystals
69	Campoy-Quiles, Mariano	Plastic photodetectors for medical imaging applications
70	Lee, Sangjin	Rheological properties of high molecular weight PET/nano-clay composite
71	Park, Seung Han	Temperature dependant rheological properties of PVA/PAN/DMSO solutions
72	Song, In-Kyu	Rheological properties of Poly(acrylonitrile)/Cellulose acetate/DMF solution
73	Jang, Kyeong Hoon	Rheological properties of the poly (vinylidene fluororide) (PVDF) solution in Dimethyl acetamide (DMAc) at various temperatures
74	Kwak, Jeonghun	Study of organic field-effect transistor performances using various organic gate insulators