Korea Science and Engineering Foundation
Hungarian Academy of Sciences

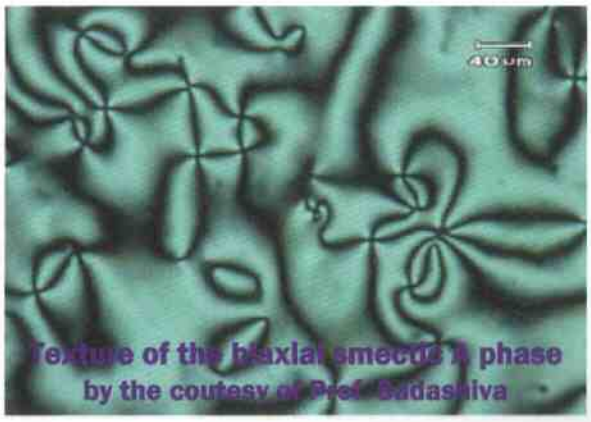
The 3rd Korean-Hungarian International Joint Workshop:

Frontier Topology and Design Concept for Neo-Mesomorphism

4-7 July 2008
Gumi (Korea)

BOOK OF ABSTRACTS

Organized by Center for Scientific Instruments,
Kumoh National Institute of Technology



Texture of the biaxial smectic A phase
by the coutesy of Prof. Sadashiva

Under Auspices of the Korean Liquid Crystal Association

6 July 2008 (SUN)

08:30 - 18:00	**Excursion**	Gyeongju (The Old Capital City)
18:30 - 21:00	**Banquet**	Jung-il Jin *Korea University, Korea*

7 July 2008 (MON) – LC Topology, Alignment and Biological Application

Chair: J. Watanabe (Tokyo Inst. of Tech., Japan)

09:00 – 09:30	**Carsten Tschierske** *Martin-Luther-University, Germany*	Complexity in Liquid Crystals
09:30 – 10:00	**Sin-Doo Lee** *Seoul National University, Korea*	Selective Growth of Bio-Membranes on Patterned Substrates Controlled by Nanotopography
10:00 – 10:30	**Myongsoo Lee** *Yonsei University, Korea*	Self-Assembly of Rod Amphiphiles into Aqueous Nanostructures

10:30 - 11:00 Coffee Break

Chair: B. K. Sadashiva (Raman Research Inst., India)

11:00 – 11:30	**Ágnes Buka** *Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences, Hungary*	Pattern Formation in Calamitic Liquid Crystals; Nonstandard Electroconvection and Flexoelectricity
11:30 – 12:00	**Lee Soon Park** *Kyungpook National University, Korea*	Polymer Dispersed Liquid Crystal Fabrication and Properties

12:00 - 14:00 Lunch

Chair: C. Tschierske (Martin-Luther-Univ., Germany)

14:00 – 14:30	**Junji Watanabe** *Tokyo Institute of Technology, Japan*	Regular Undulation Morphology Observed in Fracture Surface of Chiral S_c^* Polymer
14:30 – 15:00	**Jong-Chan Lee** *Seoul National University, Korea*	Polystyrene Derivatives for Liquid Crystal Alignment Layers

15:00 - 15:30 Coffee Break

Chair: L. S. Park (Kyungpook Nat'l Univ., Korea)

15:30 – 16:00	**Nandor Éber** *Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences, Hungary*	Flexoelectricity of Banana and Calamitic Nematics
16:00 – 16:30	**Jae-Hoon Kim** *Hanyang University, Korea*	Pretilt Angle Control of LC Alignment
16:30 – 16:40	**Workshop Closing**	**Ágens Buka** *Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences, Hungary*

Pretilt Angle Control of LC Alignment

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Abstract

The pretilt angle of liquid crystal (LC) alignment is the one of the major factors in improving characteristics of LCD. Most LCDs are based on either planar alignment or vertical alignment of the LC director by using alignment materials such as polyimide, photopolymers, surfactants, silicon oxide, and so on. With the materials, we can easily obtain low degree of pretilt angle (i.e. 0°~10° or 80°~90°) using rubbing or UV exposure techniques. However, the intermediate pretilt region (i.e. 10°~80°) is still under a challenge. If the intermediate pretilt angle is obtained easily, various applications are available and it also can be applied to the conventional LCD mode to modify electro-optic characteristics.

To obtain intermediate pretilt angle, various methods have been reported such as oblique deposition of SiOx[1], mixture of vertical and planar polyimides[2], microtextured formation by atomic force microscopic local oxidation[3], ion beam exposure of silicon carbide film[4], and fluorinated amorphous carbon film.[5] However, such approaches have some problems intrinsically such as long term stability, reproducibility, adapting to large LCDs, and high cost of manufacturing process.

In this article, we propose a new alignment method which can control continuously pretilt angles from 0° to 90° using the anchoring competition effect between planar and vertical alignment layers. The competition is generated by the coating of vertical alignment layer on planar alignment layer. The upper vertical LC alignment layer has influence directly on LC. On the other hand, the polar anchoring energy of LC induce from lower planar alignment layer is screened partially or entirely depending on the thickness of upper alignment layer. If the direct LC anchoring energy of the lower alignment layer is much larger than that of the upper alignment layer, anchoring competition occurs and then the pretilt angle could be controlled continuously by tuning the thickness of upper vertical alignment layer. The proposed technique has very simple process to apply large size of LCDs as well as good thermal stability. Moreover, the method does not require any modification of polyimide materials and conventional processes. We expect that it can be applicable to various LCD applications.

References

[1] J. L. Janning, Appl. Phys. Lett., 21, pp173 (1972).
[2] F. S. Yeung, J. Y. Ho, Y. W. Li, F. C. Xie, O. K. Tsui, PI Sheng and H. S. Kwok, Appl. Phys. Lett., 88, pp051910 (2006).
[3] B. Sang, F. K. Lee, O. K. Tsui and P. Sheng, Phys. Rev. Lett., 91, pp215501 (2003).
[4] J. B. Kim, K. C. Kim, H. J. Ahn, B. H. Hwang, D. C. Hyun and H. K. Baik, Appl. Phys. Lett., 90 pp043515 (2007).
[5] H. J. Ahn, J. B. Kim, K. C. Kim, B. H. Hwang, J. T. Kim, H. K. Baik, J. S. Park and D. Kang, 90, pp3505 (2007).