Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/gmcl19

Electro-optical Properties and Structure Features of Polyurethane LB Monolayers

Hoon-Kyu Shin [a], Jeong-Yeul Seo [a], Do-Kyun Kim [a], Hyein Jeong [b] & Young-Soo Kwon [a]

[a] Dept. of Electrical Eng. & CIIPMS, Dong-A University, Pusan, 604-714, Korea

[b] Dept. of Chemistry, Inje University, Kimhae, 621-749, Korea

Version of record first published: 24 Sep 2006

To cite this article: Hoon-Kyu Shin, Jeong-Yeul Seo, Do-Kyun Kim, Hyein Jeong & Young-Soo Kwon (2001): Electro-optical Properties and Structure Features of Polyurethane LB Monolayers, Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals, 371:1, 17-20

To link to this article: http://dx.doi.org/10.1080/10587250108024677

Mol. Cryst. and Liq. Cryst., 2001, Vol. 371, pp. 17-20

Electro-optical Properties and Structure Features of Polyurethane LB Monolayers

HOON-KYU SHIN[a], JEONG-YEUL SEO[a], DO-KYUN KIM[a], HYEIN JEONG[b] and YOUNG-SOO KWON[a]

[a]*Dept. of Electrical Eng. & CIIPMS, Dong-A University, Pusan 604-714, Korea and* [b]*Dept. of Chemistry, Inje University, Kimhae 621-749, Korea*

We attempted to fabricate an amphiphilic PU containing DCM. Also, we investigated the monolayer behavior at the air-water interface and the surface morphologies of LB films was investigated by surface pressure-area (π-A) isotherms and atomic force microscopy (AFM), respectively.

Keywords: polyurethane derivative; LB method; AFM

INTRODUCTION

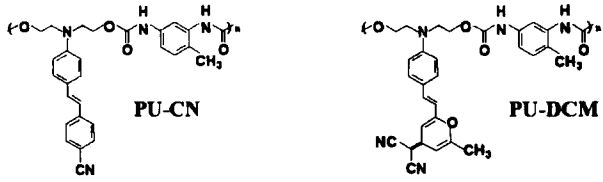
The advances in organic electroluminescent (EL) devices are revolutionary in recent years. Many kinds of organic materials for EL diodes have been developed, and the organic EL display devices are on their way to commercialization. Organic EL devices have attracted much interest because of their potentiality to produce emissions of all colors ranging from blue to red due to the wide selection of organic emitting materials[1], which are difficult to make using inorganic light-emitting diodes. In the last decade, the studies of electroluminescence in organic materials have concentrated on the thin

film type devices made of vacuum-deposited films, or polymer films[2]. The single layer EL devices using 4-(dicyanomethylene)-2-methyl-6-(4-dimethylaminostyryl)-4H-pyran (DCM)-dispersed polyurethane derivative (PU) layer were carried out in previous paper[3].

In this paper, we attempted to fabricate an amphiphilic PU containing DCM. Also, we investigated the monolayer behavior at the air-water interface and the surface morphologies of LB films was investigated by surface pressure-area (π-A) isotherms and atomic force microscopy (AFM), respectively.

EXPERIMENTAL

PU-CN and PU-DCM denote the PU derivative possessing stilbene pendant and DCM dye as a pendant, respectively (Fig.1). The synthesis of the PU derivatives was described in previous paper[4].



(a) PU-CN (b) PU-DCM

FIGURE 1. Molecular structures of polyurethane(PU) derivatives.

The surface pressure-area (π-A) isotherms were investigated by NL-LB200-MWC (Nippon Laser and Electronics Lab, Japan) Moving Wall Method; trough size: 80 mm ×585 mm). The LB transfer was carried out on a freshly cleaned silicon wafer and glass slide. We carried out AFM imaging in the non-contact mode with a commercial instrument Autoprobe CP (Park Scientific, Geneva, Switzerland).

RESULTS AND DISCUSSION

Figure 2(a) shows surface pressure-area (π-A) isotherms of PU-CN and PU-DCM on the pure water. PU-CN formed monolayer with the limiting areas of 37 $Å^2$/molecule without any transition. In contrast to this, for PU-DCM, the surface pressure developed at large molecular area of 70 $Å^2$/molecule and on the compression of the monolayer became the condensed state with the limiting areas of 66 $Å^2$/molecule through the transition region. The larger molecular area of PU-DCM seems to be ascribed to the increased hydrophilicity. Figure 2(b) shows the ultraviolet-visible (UV-vis) absorption spectra for LB films of PU derivatives. The effective absorption wavelengths of PU-CN and PU-DCM LB films are at about 550 and 650 nm, respectively.

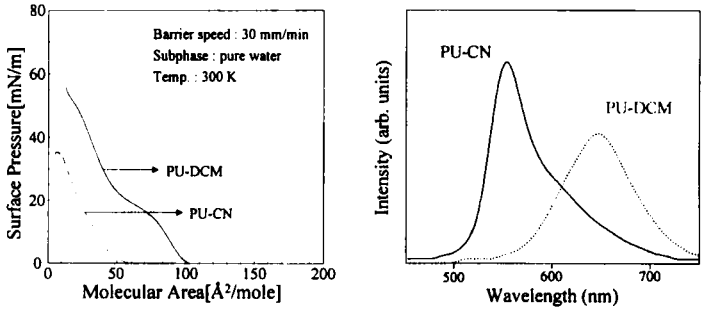
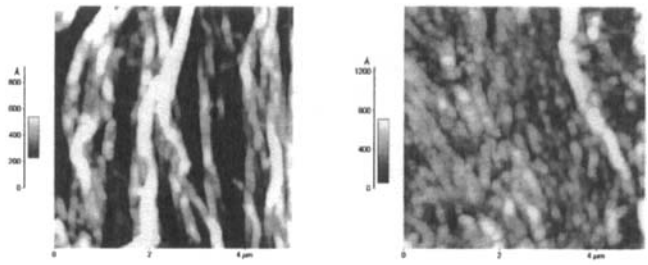


FIGURE 2. (a) surface pressure-area (π-A) isotherms (b) UV-vis absorption spectra of polyurethane(PU) derivatives.

Figure 3 shows the AFM images for LB films of PU derivatives deposited on a silicon substrate. The AFM images show the differences in the surface morphology between PU-CN and PU-DCM LB films,

such as molecular packing density, homologous series of monolayers, film thickness. We conclude that surface morphology of PU-DCN LB films is smooth and homogeneous and has optimal hydrophobicity and good stability, whereas PU-CN LB films give rougher surfaces with more excess material.



(a) PU-CN (b) PU-DCM

FIGURE 3. AFM images of LB films of polyurethane(PU) derivatives.

Acknowledgment

This work was supported by the 21C Frontier R&D Project of Korea Ministry of Science and Technology.

References

[1] Tang and S. A. VanSlyke, *Aappl. Phys. Lett.*, **51** (1987) 913.

[2] J. M. Ouyang and H. Y Liu, *Mol .Cryst. and Liq. Cryst.*, **337** (1999) 125.

[3] H. Jeong and C. S. Ha, *Mol .Cryst. and Liq. Cryst.*, **337** (1999) 349.

[4] T. Yamada, D. Zou, H. Jeong, Y. Akaki and T. Tsutsui, *Synthetic Metals*, **111-112** (2000) 237.