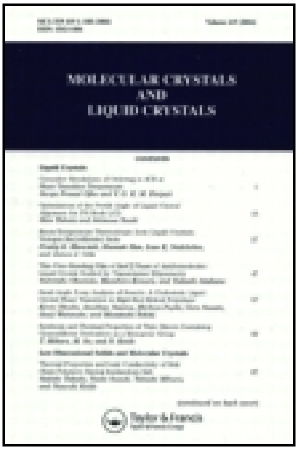

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A Study on the Physical Properties of Functional LB Monolayers

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A Study on the Physical Properties of Functional LB Monolayers

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Photoisomerization in monolayers of a azobenzene dendrimer, was investigated for the first time by means of the absorption spectrum and Maxwell displacement current (MDC) technique. Dendrimers are well-defined macromolecules exhibiting a tree-like structure, first derived by the cascade molecule approach. According to the absorption spectrum, trans-to-cis conversion ratio was estimated to the generation

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of azobenzene dendrimer. Charge with trans-cis isomerization was also measured by means of MDC technique.

Keywords: Azobenzene dendrimer; Maxwell displacement current; photoisomerization

INTRODUCTION

In the Langmuir-Boldgett (LB) technique, a monolayer on the water surface is transferred on to a substrate, which is raised and dipped through the surface, and one can obtain multilayers in which constituent molecules periodically are arranged in layer. The LB technique has attracted considerable interest in the fabrication of electrical and electronic device, e.g., many researchers have investigated the electrical properties of monolayer and multiplayer films [1–3].

Dendrimers represent a new class of synthetic macromolecules characterized by a regularly branched treelike structure. Multiple branching yields a large number of chain ends, which distinguishes dendrimers from conventional starlike polymers and microgels.

Azobenzene dendrimer is one of the dendritic macromolecules that includes the azo-group which exhibits a photochromic character. Due to the presence of the charge transfer part, the azo-group, and having a rod-shaped structure, these compounds are expected to have the potential interest in electronics and photoelectronics, especially in nonlinear optics.

In the present paper, we give a pressure stimulation into organic thin films and detect the induced displacement current.

EXPERIMENT

Chemical structure of AZ-G4 monomer is shows in Figure 1. Monolayers of AZ-G4 were spread from dilute chloroform solutions onto the surface of pure water.

The displacement current I was measured by an electrometer (Keithley 6517).

AZ-G4 was spread on pure water (pH6.0, 18.2 MΩ cm) and maintained at 20°C. After a monolayer was rested for 5 minutes, the monolayer was compressed at a compression speed of 40 mm/min. MDCs were measured during monolayer compression. Irradiation with UV light ($\lambda_1 = 365$ nm) and visible light ($\lambda_2 = 450$ nm) region at AZ-G4 monolayers. Absorption spectra measured using a UV-visible recording spectrophotometer (Hitachi U-3501 spectro photometer).

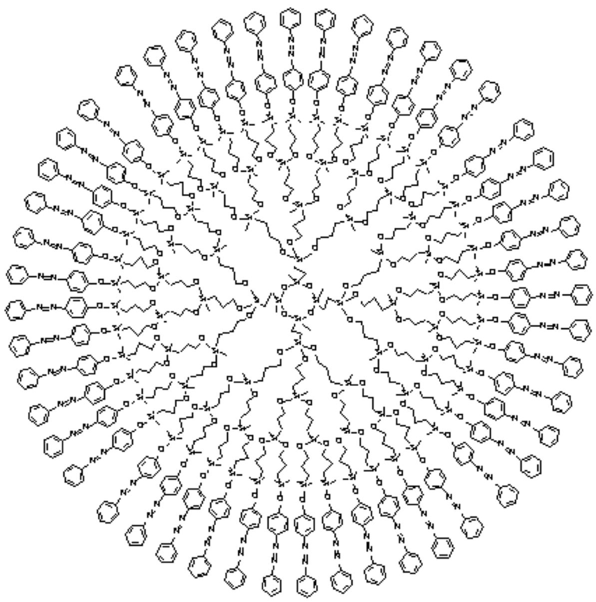

FIGURE 1 Molecule structure of AZ-G4.

RESULTS AND DISCUSSION

Figure 2 shows the current generated from AZ-G4 molecules during the compression with a constant barrier velocity in the area per molecule ranging from $5900\,\text{Å}^2$ to $1800\,\text{Å}^2$. Surface pressure-area isotherm is also shown in the figure. A current peak appears in the range of molecular area A between $4900[\text{Å}^2]$ and $1800[\text{Å}^2]$ by monolayer compression. The absorption spectrum of AZ-G4 is shown in Figure 3. A peak appears at around the wavelength barrier wavelength λ of 340 [nm].

In addition, by irradiating ultraviolet light ($\lambda_1 = 360\,\text{nm}$) and light of visible light ($\lambda_2 = 450\,\text{nm}$) region at AG-G4 organic monolayer known as cis-trans structure the displacement current in accordance with light stimulus were detected and compared.

Figures 4 and 5 shows typical results of MDC measurements of the AZ-G4 mono-layers with estimated induced charge. MDC current is generated with alternating 365 nm and 450 nm light irradiation and, the direction of the current is alternated. The charge flowing across the monolayer during cis-to-trans photoisomerization can be estimated by integrating the displacement current. When do photoirradiation, surface pressure changed, and with size of happened

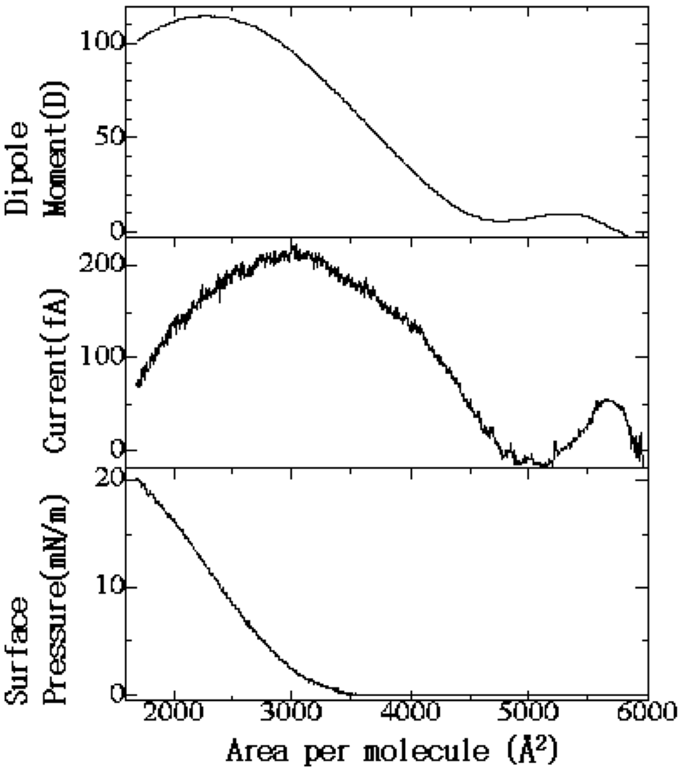

FIGURE 2 Displacement current of compress.

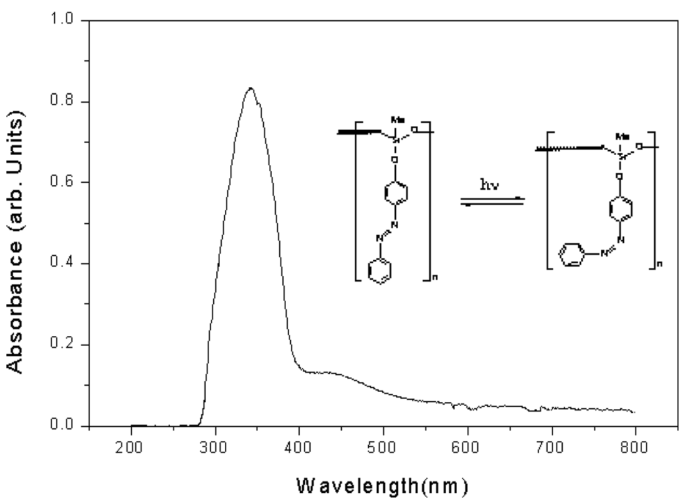

FIGURE 3 Absorption of AZ-G4.

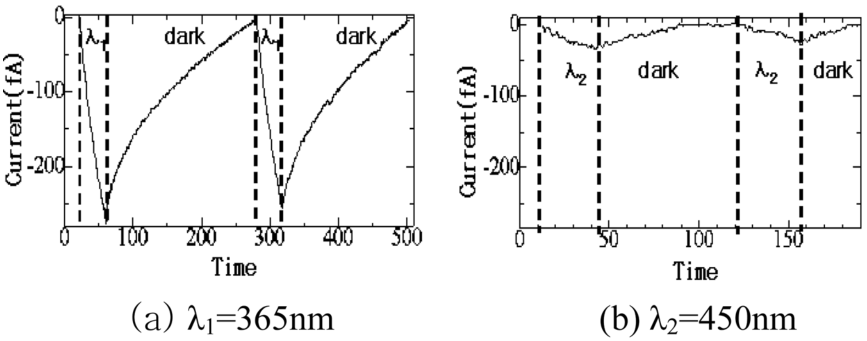

FIGURE 4 Photoirradiation displacement current of AZ-G4.

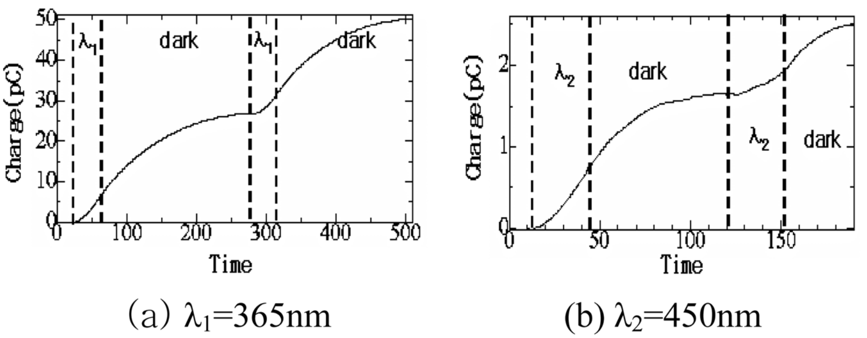

FIGURE 5 Photoirradiation charge of AZ-G4.

displacement current 365 nm could know than 450 nm that surface pressure change shows more greatly.

CONCLUSION

We have investigated the photoisomerization phenomenon in a azobenzene dendrimer, by means of the absorption spectrum and MDC technique. Shows the current generated from AZ-G4 molecules during the compression with a constant barrier velocity in the area per molecule. According to the absorption spectrum, trans-to-cis conversion ratio was estimated to the generation of azobenzene dendrimer. Charge with trans-cis isomerization was also measured by means of MDC technique.

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