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The Effect Of External Electric Field And Substrate Surface On Molecular Anchoring To Increase The Refractive Index Of DR-1 Film

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Research Highlights

The Disperse Red-1 (DR-1) molecule with its conjugated chain structure is known to offer great potential for photonic device applications, such as optical switching and optical data storage. For the aforementioned device applications, thin film of those molecules must be fabricated satisfying the requirements of having smooth and flat surface, uniform thickness and stable structure as well as attractive optical properties. As a result of this research, DR-1 films have been obtained which exhibit crystalline structure with the molecules deposited in parallel polar orientation perpendicular to the substrate and regular head to tail stacking when the electric field applied larger than 0.59 MV/m. This is understood to be result of the formation of strong hydrogen bonding acting as the anchoring mechanism. In addition, it is shown an increase in the optical refractive index as a result of an increase in the external electric field in the deposition process of the DR-1 films.

Research Objectives

This research is aimed to study surfactant effect of ITO substrate surface and the effect of external electric field applied during the deposition procces on properties of the resulted DR-1 film. Further, the anchoring mechanism involved in the deposition of the molecule is investigated in relation with the properties of the fabricated film. In addition to that, the optical property (refractive index) of the DR-1 film is also investigated to study the effect of the applied electric field.

Methodology

In this research, a special electric field assisted Physical Vapor Deposition (PVD) method has been developed allowing the deposition process to be carried out under varied electric field. Samples in the form of thin films were deposited on an ITO substrates using VPC 410 Vacuum Evaporator from Ulvac Sinku Kiko. The films were prepared with various external electric field strengths of 0 until 3.3 MV/m. The duration of the deposition process of all the thin films was about 1 hour. No further treatment was performed on the deposited films.

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Characterization of structure and molecular orientation of DR-1 films obtained with SEM-EDX (SEC, SNE-4500), RAS-FTIR Perkin Elmer and UV-Vis Spectrometer Lamda 35 Perkin Elmer. Measurements of the refractive index and film thickness were carried out using the NanoCalc-2000 VIS Reflectometer.

Results

The SEM image recordings show that with the help of the external electric field, the resulting film shows an orderly structure which increases with the formation of a crystalline structure in the film on the surface of about 3.3 MV/m. RAS-FTIR data analysis shows the occurrence of hydrogen bonding between DR-1 molecules deposited with ITO substrates. Furthermore, analysis of UV-VIS spectroscopy shows that the molecule is deposited in a parallel direction perpendicular to the ITO substrate surface. This result supports the stability of film structure thanks to a strong anchoring mechanism. Reflectometer measurements on DR-1 films show an increase in the optical refractive index as a result of an increase in the external electric field in the deposition process of the DR-1 films.

Findings

As a result of this research, DR-1 films have been obtained which exhibit crystalline structure with the molecules deposited in parallel polar orientation perpendicular to the ITO substrate and regular head to tail stacking when the electric field applied larger than 0.59 MV/m. This is understood to be result of the formation of strong hydrogen bonding acting as the anchoring mechanism. In addition, it is shown that the refractive index of the DR-1 film is affected by the strength of the applied electric field.

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References

Marino, I.G., R. Raschella, P.P. Lottici, and D. Bersani (2008). Chromophore Aggregation and Photoinduced Dichroism in Sol-Gel Films. Journal of Non-Crystalline Solids, 354, 688-692.

Priimagi, A., and M. Kaivola (2007). Enhanced photo induced birefringence in polymer-dye complexes: hydrogen bonding makes a difference. Applied Physics Letters, 90, 121103.

Wenas, D.R., D.A. Setia, A. Dafananto, Narayana, R. Hidayat, H. Taunaumang, Herman, R.E. Siregar, and M.O. Tjia (2008). Structural and spectroscopic study of aggregation effect in DR1 thin films deposited by E-PVD method. Proc. ICMNS, 978, 679-683.

Wenas, D.R., Herman, R.E. Siregar, and M.O. Tjia (2010). X-Ray Diffraction Pattern and Optical Properties of Disperse Red-1 Thin Films Deposited by Electric Field Assisted PVD Method. American Institute of Physics, CP1250, 349-352.

Taunaumang, H., M. Solyga, M.O. Tjia, and A. Miniewicz (2004). On the efficient mixed amplitude and phase grating recording in vacuum deposited Disperse Red 1. Thin Solid films, 461, 316-324.

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