

폴리비닐알코올/요드 복합체 필름의 분자량 차이에 따른 광학특성

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Effect of Molecular Weight of Poly(vinyl alcohol)/Iodine Complex Films on the Optical Properties

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1. Introduction

Poly(vinyl alcohol)(PVA)/iodine complex has long been investigated with various points of view since Staudinger et al.¹, who found that the blue color was have developed by iodination in an aqueous solution of PVA. PVA/iodine complex film is the best polarizing material for liquid crystal display. The most commercially employed polarizing film is the PVA-iodine complex, which was invented by E. H. Land in 1938. In the crystalline and amorphous phase of the polarizing film, PVA molecules form a complex with oligo iodine ions, which orient parallel to the drawing direction to give a polarizing effect². It is well known that polyiodide ions interrupt the intermolecular hydrogen bonds and make a complex with polymer chains not only in crystalline but also in amorphous regions of several polar polymers such as nylon 6, polyacrylonitrile, and PVA³.

In this study, we made the iodinated PVA films for polarizing film with different number-average degree of polymerization(P_n) of 1700 and 4000, in various quantities of I_2/KI and investigated the optical properties for polarizing films on effect of molecular weight of PVA.

2. Experimental

Preparation of PVA films: PVA films having a thickness of about 20-70 μm were prepared by casting PVA with a number-average degree of polymerization (P_n) of 1700 and 4000, which were dissolved in water at 100 °C for 3 h. (P_n 1700, Dong-Yang chemical Co., Ltd, Korea; 4000, Kolon Co., Ltd, Korea) The PVA aqueous solutions (concentration of PVA solution : P_n 1700- 6.8 g/dl, P_n 4000- 2.3 g/dl) were poured into a stainless steel dish and dried at 20 °C for 1-2 days.

Preparation of polarizing films: PVA films were soaked in I_2/KI ($I_2:KI = 1:2$) aqueous solution with 0.015 and 0.03 mol/l at 40 °C for 1 min. The PVA/iodine complex films obtained from the solutions were rinsed in cold water to remove the solution adhered to the film surfaces and dried at room temperature. And the complex films were drawn to 4 times by automatic drawer at 40°C in 5wt% boric acid aqueous solution with 10mm/min drawing speed. The stretched films were washed with water and dried in a vacuum a uniform tension for one day.

Investigation of optical properties: Optical properties of the polarizing films were examined by UV-visible spectrometry(UV-2401PC, Shimadzu). Transmittance and polarizing efficiency (PE) were

investigated at the absorption maximum of the polarizing films according to following equation:

$$PE(\%) = [(Y_{\parallel} - Y_{\perp}) / (Y_{\parallel} + Y_{\perp})]^{1/2} \times 100$$

Where Y_{\parallel} and Y_{\perp} are the transmittances of the film superimposed on each other parallel and perpendicular to the direction of the elongation of the film, respectively.

Durability: polarizing films were kept in a constant temperature and humidity chamber (relative humidity of 80% and temperature of 50°C). Durability for heat and humidity of polarizer was evaluated from the change of PE

3. Results and discussion

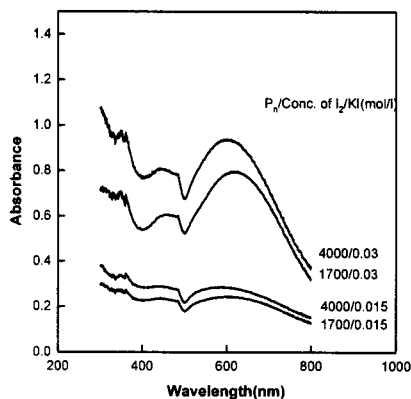


Figure 1. Absorbance of PVA/iodine films drawn 4 times with different P_n and conc. of I_2/KI .

P_n	Conc. of I_2/KI (mol/l)	Transmittance (%)	Degree of polarization (%)
1700	0.015	42.74	99.96
	0.03	23.16	99.88
4000	0.015	45.91	99.99
	0.03	27.34	99.97

Table 1. Transmittance and degree of polarization of PVA/iodine films drawn 4 times with different P_n and conc. of I_2/KI .

Figure 1 shows the absorption spectra of iodinated and drawn PVA films. The absorption maxima at around 350 and 600nm increased with P_n and concentration of I_2/KI . The former has been attributed to the complex with $I_2-I_3^-$, and the latter to I_5^- . The quantity of the complexes increase with molecular weight of PVA is more remarkable than that of conc. of I_2/KI .

Table 1 shows degree of polarization and transmittance of the polarizing films with P_n 1700 and P_n 4000 according to weight gain of I_2/KI . As the P_n increased and weight gain of I_2/KI decreased, transmittance of the film increased with degree of polarization almost the same.

4. Acknowledgements

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5. References

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