하드 세그멘트 구조 변화가 세그멘트화 블록 코폴리에테르에스테르의 기계적 성질에 미치는 효과(II)

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Mechanical Property of Segmented Block Copolyetherester Effected by Changing the Hard Segment(II)

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1. Introduction

In general, the thermoplastic elastomers have the elastic recovery property caused by phyical crosslinks after the stress is applied. Segmented block copolyetheresters also have been used as elastomers. Many[1-2] tried to improve the elastic recovery of those which are less elastic than polyurethane. We confirmed that the copolyetherester based on poly(2,6-butylene naphthalate)(PBN) hard segment had the high melting temperature, whcih was useable at the broader temperature range and the one based on poly(1,3-trimethylene terephthalate)(PTT) the high crystallinity, which would be expected to get the high elastic recovery.

The elastic recovery can be shown well as the soft segment move fully back with the aid of crosslinking. But the morphology of segmented block copolyetheresters have been revealed that the phase of soft segment exist both in the mixed phase of hard and soft segment and in rich phase of soft segment[3]. Each segments may be deformed and oriented toward the direction of applied stress. The mobility of soft segment connecting different hard segments and the crystal mobility may make the difference of orientation.

In this study, we have studied the uni-axial deformation and orientation behavior of copolyetheresters based on the different hard segment over the hard segment content.

2. Experimental

Copolyetheresters with PTT, PBT, and PBN hard segment and PTMG(poly(tetramethylene oxide) glycol, Mw 2000) soft segment were synthesized by the conventional two step condensation reaction. Each hard segment of copolyetheresters has 80, 65, 50, 35, 20wt% content. All samples with dumb-bell shape were prepared by a mini-max molder above 2 0℃ melting temperature. For 1 hour, annealing of samples to remove the thermal history was performed at the oil-bath purged with N_2 below 20℃ melting temperature. Tensile tests were performed by Instron 4467 and attentuated total reflectance(ATR) IR spectra were obtained with a MIDAC FT-IR spectrometer on a KBR-5 substrate.

3. Results and Discussion

The deformation behavior of copolyetherester can be influenced by the change of

morphology. In the uni-axial deformation, the initial modulus and strain with the variation of hard segment content were shown in Figure 1. At the small content of hard segment, initial modulus don't show significant difference because of the abundance of soft segment which form the matrix. But the increase of hard segment make sure the effect of difference hard segment. PTT hard segment showed the highest initial modulus caused by the high crystallinity. After the tensile tests and relaxation, the molecular orientation of samples could be examined by the ATR IR spectra. Each bands was normalized and the dichoric ratio was compared. The least orientation of soft segment among the all samples was at the 80wt% of copolyetherester with PTT. It is a consequence of the highest hard segment crystallinity and an influence of matrix phase. Because of the more phase separation, deformation may be applied to the hard segment matrix and then the relaxation of soft segments can be easily occured at the higher hard segment content.

4. Reference

1. Francisco J. B., Zbigniew R., "Block Copolymers", Marcel Dekker, New York 2000.
2. W. Gabrielse, V Guldener, H Schmalz, V Abetz, R Lange, *Macromolecules* **35** 6946(2002)
3. A. Schmidt, W S Veeman, V M Litvinov, W Gabrielse, *Macromolecules* **31** 1652(1998)

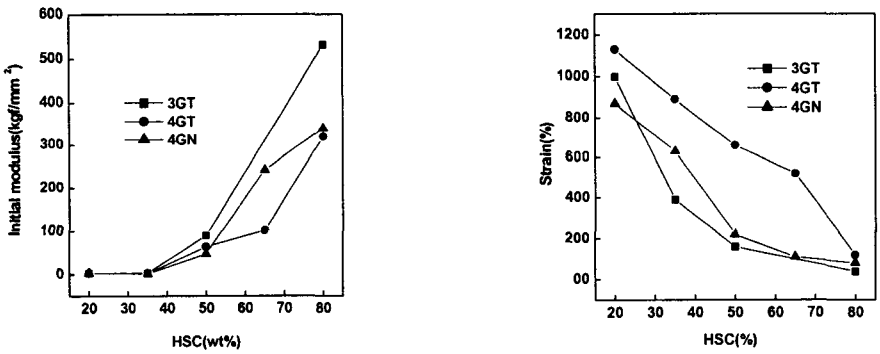

Figure 1. The initial modulsu and strain with the variation of hard segment content

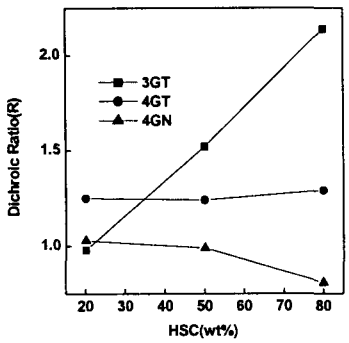

Figure 2. The dichroic ratio of soft segment having different hard segments