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Effect of Soft Segment Component on Moisture Permeable Polyurethane Films

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Development of the function of moisture permeability in segmented polyurethane films has investigated. Moisture permeable polyurethane films prepared by solvent cast method with various content of polytetramethyleneglycol (PTMG) and polyethyleneglycol (PEG) having molecular weight of 2000 in soft segment were discussed at former study. Moisture permeability increased with increasing content of PEG. As a result in the case having low content of PEG in soft segment with low moisture permeability, aggregate structure of hard segment grew intermediate hydrogen bond of urethane group. On the other hand high content of PEG indicating high moisture permeability, it was considered that growth of aggregate structure was inhibited by ether group of PEG skeleton bonding to N-H in urethane group. It was clarified that PEG in soft segment affected aggregate structure of hard segment and changed moisture permeability. In this study, molecular weight of PTMG and PEG was changed systematically and polypropyleneglycol (PPG) concerning the steric hindrance was used in soft segment. Aggregate structure of hard segment was investigated by higher order term Δh introduced in Mooney-Rivlin equation of rubber elasticity from the results of stress-strain relation and hydrogen bonded concentration in urethane group using Fourier transform infrared spectrometer. Restraint of soft segment was measured by dynamic mechanical analysis. Furthermore, the molecular mechanisms in polymer-water sorption phenomena in films were discussed by FT-IR measurement using films conditioned at a relative humidity. Moisture permeability changed with the content and molecular weight of PEG. Whereas PPG system, moisture permeability was lower than PEG system. Also, aggregate structure changed with PEG and PPG system in terms of content and molecular weight. Aggregate structure of PPG system was higher than that of PEG system. It is considered that the steric hindrance of PPG inhibited ether group to bond with N-H in urethane group, therefore aggregate structure grew sufficiently.