

수분산 폴리우레탄과 그의 블렌드물의 제조 및 물성

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Preparation and Properties of Waterborne Polyurethanes and Their Blend Films

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1. Introduction

Recently, Waterborne polyurethane(WBPU) have been used for a wide range of commercial applications due to the increasing environmental regulation to reduce low-volatile organic compounds in coating and adhesives materials [1-8]. The WBPU was used in coating industry on fiber at first, and its market is increasing these days. Especially, the Waterborne polyurethane film even is widely used in the field of breathable coating fiber or medical science [9-10]. Water vapor permeability(WVP) is the key property for application to breathable coating fiber.

In this study, Two kinds WBPU (soft segment content : 75%, solid content: 40%) were prepared from H_{12} MDI/DMPA/EDA/triblock polyol(caprolactone_{4.5}-PTMG(Mn=2,000)-caprolactone_{4.5}) and PTMG(Mn=3000). Sodium Chloride(NaCl) as a type of salt has a good solubility. As it added to WBPU it will occupy a small space in WBPU, and when we elute it by using water, we can expect a microvoid in the WBPU film. As a result we can expect to get a WBPU which has an excellent WVP. We added NaCl to Waterborne polyurethane(WBPU) by using homogenizer to enhance its water vapor permeability. The effect of NaCl ratio to DSC curve, dynamic thermal properties, and water vapor permeability of WBPU was investigated.

2. Experimental

2.1. Materials

Polyoxytetramethylene glycol (PTMG, Mw= 2,000, Korea polyol) and ϵ -caprolactone(ϵ -CL, Sigma) were distilled at 95°C under vacuum(15mmHg) before use. Biscyclohexyl-methane 4,4-diisocyanate (H_{12} MDI, Aldrich Chemical), Dimethylol propionic acid (DMPA, Aldrich Chemical), ethylene diamine (EDA, Junsei Chemical), triethylamine (TEA, Junsei Chemical), and N-methyl-2 pyrrolidone(NMP, Junsei Chemical) were used after dehydration with 4Å molecular sieves for one day. Sodium chloride (NaCl, Junsei Chemical), dibutyl tin dilaurate (DBTDL, Aldrich Chemical), and hardener (Desmodur DA, Bayer) were used without further purification. Distilled water was used as a solvent for polymer blend.

2.2. Synthesis of WBPU

The WBPUs of triblock polyol type and PTMG type were prepared as the preceding way in our laboratory [11]. WBPU was added in various ratio of NaCl (0, 0.01, 0.03, 0.05, 0.1, and 0.3 wt% of WBPU). And it was stirred about 11,000 rpm by homogenizer for 5min at 36°C.

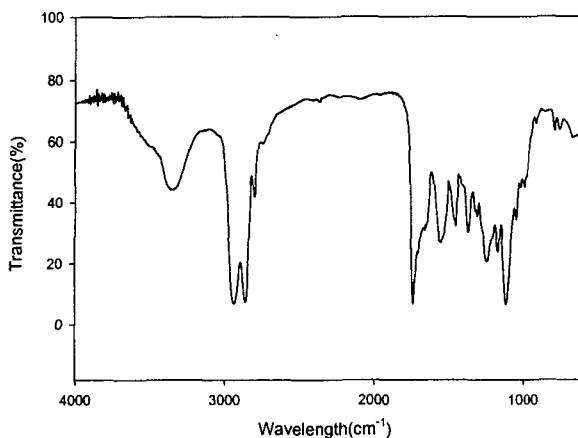


Figure 1. IR-Spectra of WBPU

Figure 1 shows IR spectra of WBPU prepared from triblock polyol. The N=C=O stretching band near 2270cm^{-1} completely disappeared, indicating the completion of reaction.

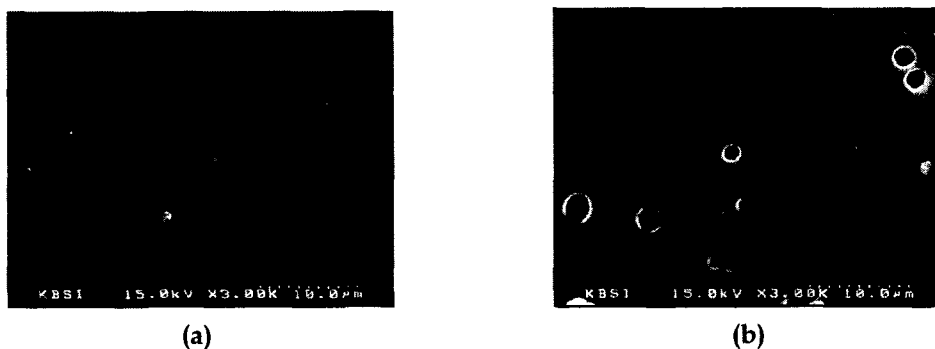


Figure 2. SEM micrographs for WBPU(a) and WBPU/NaCl (b)

Figure 2 shows SEM micrographs for WBPU(a) and WBPU/NaCl(b, 0.01 wt% NaCl). It is indicating the microvoids on the film surface after the elution of NaCl by using water. It may be very helpful to improve water vapor permeability.

4. References

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