# Annealing Effect on Thermal and Mechanical Property of Polycarbonate/Poly(ether ester) Copolymer Blend

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## INTRODUCTION

Physical annealing of amorphous polymers is a consequence of the nonequilibrium nature of the glassy state. There is a driving force for such materials to proceed toward a more dense equilibrium state. This process is extremely slow at ambient conditions for engineering polymers, but is accelerated by annealing just below the glass transition temperature. Polycarbonate is a widely used amorphous engineering polymer with its outstanding properties. Poly(ether ester)s are typical representatives of thermoplastic elastomers. Numerous papers and patents are dedicated to these unique high-performance thermoplastic elastomers, which combine good physical characteristics of chemically cured elastomers with the easy processability of thermoplastics. In this study, blends of polycarbonate and poly(ether ester) are annealed to examine the annealing effect on the thermal and mechanical property changes.

## EXPERIMENTAL

The Dow (300-1) polycarbonate and poly(buthylene terephathalate-co-polytetramethyleneglycol) were used for blending. All polymers were completely dried under vacuum before blending. The polymers were melt-blended at 240°C for 7 minutes and then injection-molded using Mini-Max injection molder (Model CS-183 MMX, CSI). The injection-molded samples were annealed under vacuum at 130°C for 5 and 10 hours. The molded dumbell type specimens were tested on a tensile tester with a cross-head speed of 20 mm/min. The glass transition temperature, melting temperature and heat of fusion were determined by Perkin-Elmer DSC-7.

## RESULTS AND DISCUSSION

As shown in Figure 1, the energy to break of blended samples increases with annealing time except that of pure polycarbonate which is almost independent of annealing time. The heat of fusion from DSC shows that the crystallinity of poly(ether ester) increases with annealing. This indicate that the domain-formation of hard segment in poly(ether ester) becomes more evident, suggesting that the role of poly(ether ester) component as a thermoplastic elastomer comes to be more efficient. As a result, the modulus decreases and the elongation to break increases as the annealing time increases.

## REFERENCES


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2. D.J. Hourston and I.D. Hughes, ***Polymer***, **20**, 823 (1979)


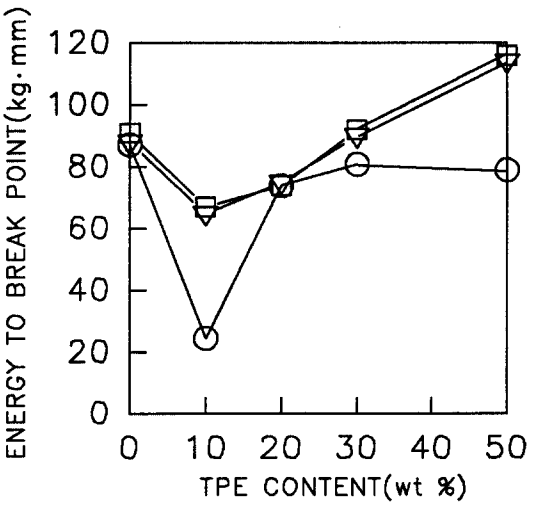


**Fig.1.** The effect of poly(ether ester) on energy to break (○without annealing:▽5h annealing:□10h annealing).

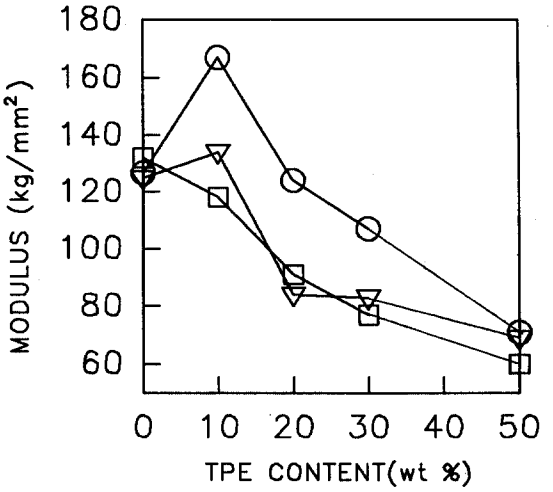


**Fig.2.** The effect of poly(ether ester) on modulus (○without annealing:▽5h annealing:□10h annealing).