

## Structure-Shape Memory Effects of Noncrystallizable Polyurethane

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One of the advanced high-performance materials for which development and study of practical use have recently progressed is shape memory material. Among the shape memory materials, the practical application of shape memory alloy is under way. Concurrently, the development of the applications of shape memory polymer is also drawing attention.

Because shape memory polymer is light, high in shape recoverability, easy to manipulate and economical as compared with shape memory alloy, its development is being actively promoted. One of the applications of shape memory polymers is temperature sensing elements. These polymers basically consist of two phases, viz., fixed points or frozen phase and reversible phase. Accordingly, excellent shape memory effects have often been observed with trans-polyisoprene(TPI), styrene-butadiene copolymer(SB) and segmented polyurethanes(PU). In these materials, the crystalline soft domains form the reversible phase, and hard domains become the fixed points or frozen phases.

We report the preparation and shape memory properties of amorphous polyurethanes where the glass transition( $T_g$ ) becomes shape memory temperature. PUs were prepared from PPG 400, MDI, and several different types of chain extender including ethylene glycol, butane glycol, and bis(hydroxyethoxy)benzene. It was found that  $T_g$  can be varied in a broad range depending the composition and preparation sequence of PU, whereas the rubbery state modulus varied with the type and length of extender.