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Precise Analysis of Perfect Zero-Birefringence Polymer YUKI OKADA, OSAMU URAKAWA, TADASHI INOUE, Osaka Univ — Control of strain-induced birefringence of amorphous polymers is an important issue for their optical applications. It is widely accepted that strain-induced birefringence of amorphous polymers has two origins, segment orientation and glassy deformation. The intrinsic birefringence, Δn_0 and the photoelastic coefficient, C_d, are indexes of the two origins, respectively. $\Delta n_0 - C_\mathrm{d}$ map help us to predict strain-induced birefringence of copolymers. Perfect zero-birefringence polymers, PZP, means $\Delta n_0 = 0$ and $C_\mathrm{d} = 0$. One of the method to obtain the PZP is random copolymerization of three kinds of monomers. In a three components system, the birefringence of copolymers can be characterized by a point inside of the triangle region formed by three points for homopolymers of the three monomers in $\Delta n_0 - C_\mathrm{d}$ map. In this study, PZP of MMA (Methyl methacrylate), TFEMA (Trifluoroethyl methacrylate) and BzMA (Benzyl methacrylate) was synthesized and its birefringence behavior was analyzed. Following the reported composition, we synthesized PZP and conducted dynamic birefringence measurement. Δn_0 value of the synthesized PZP was unexpectedly large at high temperatures because Δn_0 of PMMA and PBzMA showed temperature dependence. More importantly, we found that zero birefringence of PZP is achieved only at a certain temperature. We will also discuss effect of sub relaxations in the talk.

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