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Effects of mechanical strain and heat on the strain-induced crystalline β to α structural transition of syndiotactic polystyrene. FUYUAKI ENDO, ATSUSHI HOTTA, Department of Mechanical Engineering, Keio University — The polymorphic behavior of syndiotactic polystyrene (sPS) during the β to α form transition was investigated. sPS presents complex polymorphism with five crystalline forms. Quite a few crystalline structural transitions have also been reported, including our recent discovery of the structural transition from β to α forms induced by tensile deformation at around 200C. In this study, we analyzed the individual effects of mechanical strain and heat on the β to α crystalline structural transformation caused by the mechanical deformation. sPS film samples containing β form crystals were prepared and stretched at 130C (near the glass transition temperature of sPS), followed by the annealing process of the samples below the melting temperature. X-ray analyses revealed that the stretched sample possessed mesomorphic α forms, indicating that the mechanical strain could invoke the destruction of β form crystals by producing mesomorphic α forms. Interestingly, the annealed samples exhibited sharp X-ray reflections typical of α forms, which became even sharper by the increase in the annealing temperature. It was therefore concluded that the heat could induce the structural transitions from mesomorphic α forms to perfect α forms.

Fuyuaki Endo
Department of Mechanical Engineering, Keio University

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