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Solid to solid beta to alpha form transition in crystalline structures of syndiotactic polystyrene (sPS) TETSU OUCHI, SUGURU NAGASAKA, ATSUSHI HOTTA, Department of Mechanical Engineering, Keio University — The new solid to solid crystalline transition from beta to alpha forms in syndiotactic polystyrene (sPS) was discovered and analyzed. sPS has five crystalline structures: alpha, beta, gamma, delta, and epsilon forms. Among these crystalline structures, alpha and beta forms are two major crystalline structures due to their high mechanical properties. In this research, it was found that the transition was induced by mechanical strain well below the melting temperature of sPS (273 deg C) unlike the reverse transition from alpha to beta form observed at 260 deg C. The transition became more pronounced as testing temperature increased from 130 to 220 deg C. The transition should occur under the interaction of annealing process and mechanical strain, as the transition would not occur just by raising temperature. It was concluded from our experimental results that the destruction of the β form first took place under mechanical strain, causing beta form to transform into not only alpha form but also mesomorphic alpha form. The hot environment had a great impact on the perfection and the promptness of the transition: testing temperature could accelerate the transition ending up with more perfect alpha form transformed from beta form through mesomorphic alpha form.

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