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A 2D Synchrotron X-Ray Study on Stress-Induced Crystallization of Propylene-1-Butylene Random Copolymer: Polymorphism and Preferred Orientation[1] YIMIN MAO, CHRISTIAN BURGER, XIAOWEI LI, BENJAMIN HSIAO[2], Chemistry Department, Stony Brook University, DEREK THURMAN, ANDY TSOU, ExxonMobil Chemical Company — Crystallization process of propylene-1-butylene (P-B) random copolymer during mechanical stretching was investigated in real time using synchrotron x-ray scattering technique. Scattering data was studied based on 2D whole pattern analysis. Before stretching, the crystalline phase in P-B copolymer was a mixture of α and γ phases of isotactic polypropylene homopolymer. Upon stretching, the c-axis of both α- and γ-phase became aligned with the stretching direction (fiber axis). At high strains, γ-phase gradually transformed to α-phase. A mesomorphic phase featured with strong diffuse scattering in equatorial direction was observed at high strains at low temperature. However, it was not observed at high temperatures because of high chain mobility. In this case, a secondary crystallization of alpha phase crystal appeared at high strains. The newly grown daughter lamellae exhibited an 81^o tilting angle with respect to the fiber axis, resulting in the a-axis orientation of alpha phase.

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