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Structure Development and Properties of High-speed Melt Spun Poly(butylene terephthalate)/Poly(butylene adipate/terephthalate) Bicomponent Fibers

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Ultra-high-speed bicomponent spinning of poly(butylene terephthalate) (PBT) as sheath and biodegradable poly(butylene adipate/terephthalate) (PBAT) as core was accomplished with take-up velocity up to 10 km/min. The structure development of individual component in PBT/PBAT bicomponent fibers and properties of as-spun fibers were investigated using differential scanning calorimetry, wide-angle X-ray diffraction (WAXD), birefringence and tensile test. Both highly oriented and non-oriented crystal structures were observed in WAXD patterns of PBT/PBAT bicomponent fibers. *In-situ* WAXD measurement during heating was conducted to assign the two types of crystal structure, and to evaluate the crystallinity of each component. Birefringence data suggest that the molecular orientation of PBT component in PBT/PBAT fibers is higher compared with that of corresponding PBT single-component fibers, whereas PBAT component shows extremely low molecular orientation despite of high take-up velocities where PBAT single-component fibers exhibit fairly high birefringence. The effects of the enhanced and suppressed structure development of PBT and PBAT components respectively, on the thermal and mechanical properties of PBT/PBAT fibers were discussed.