Abstract Submitted
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Radial distribution of crystallinity in poly(trimethylene terephthalate) fibers characterized by confocal Raman spectroscopy JING WU, New Jersey Institute of Technology — Confocal Raman spectroscopy is used to characterize the radial distribution of crystallinity in poly(trimethylene terephthalate) (PTT) fibers. Raman scattering spectra are taken at different radial positions from fibers prepared at take-up speeds of 1000, 2500 and 4750 m/min. For each fiber, spectra taken at all radial positions do not show substantial difference in the spectral range above 400 cm^{-1}. In the spectral region below 300 cm^{-1}, however, spectra exhibit systematic changes along the radial direction. For fibers prepared by low take-up speeds, as Raman scattering volumes move from fiber surface to core, a peak centered at 140 cm^{-1} emerges, suggesting an increase in crystallinity. For fibers prepared at high take-up speeds, the reverse trend is observed - the peak centered at 140 cm^{-1} is observed on the fiber surface, not in the fiber core. The competition between orientation and quenching is responsible for the observed trend. The spectral peak at 140 cm^{-1} lies in the Terahertz (THz) regime. Our data suggest the significance of THz dynamics in polymer crystallization. Detailed discussions will be presented.

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