Abstract Submitted
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Diameter-Dependent Modulus and Melting Behavior in Electrospun Semicrystalline Polymer Fibers[1] YING LIU, SHUANG CHEN, Department of Material Science and Engineering, Stony Brook University, EYAL ZUSSMAN, Department of Mechanical Engineering, Technion-Israel Institute of Technology, CHAD KORACH, WEI ZHAO, Department of Mechanical Engineering, Stony Brook University, YICHEN GUO, MIRIAM RAFAILOVICH, Department of Material Science and Engineering, Stony Brook University — Confinement of the semicrystalline polymers, poly-(ethylene-co-vinyl acetate) (PEVA) and low-density polyethylene (LDPE), produced by electrospinning has been observed to produce fibers with large protrusions, which have not been previously observed in fibers of comparable diameters produced by other methods. SAXS spectra confirmed the crystalline structure and determined that the lamellar spacing was almost unchanged from the bulk. Measurement of the mechanical properties of these fibers, by both shear modulation force microscopy (SMFM) and atomic force acoustic microscopy (AFAM), indicates that the modulii of these fibers increases with decreasing diameter, with the onset at $\sim$10 μm, which is an order of magnitude larger than previously reported. Melting point measurements indicate a decrease of more than 7% in Tm/T_0 (where Tm is the melting point of semicrystalline polymer fibers and T_0 is the melting point of the bulk polymer) for fibers ranging from 4 to 10 μm in diameter. The functional form of the decrease followed a universal curve for PEVA, when scaled with T_0.

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