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Synchrotron X-ray Scattering Studies of Poly(lactide) Electrospun Fibers Containing Carbon Nanotubes YAZHE ZHU, PEGGY CEBE, Tufts University — Carbon nanotubes(CNTs) often serve as an effective nucleating agent that facilitates the crystallization of semicrystalline polymers. Here we study the influence of CNTs on thermal and structural properties of Poly-lactide (PLA), which is well-known as a biodegradable and biocompatible thermoplastic polymer. The effect of CNTs on the crystallization and melting behavior of electrospun fibers of poly (L-lactide) (PLLA, with 100% L-isomer) and poly (D-lactide) (PDLA, containing 4% D-isomer) was systemically studied by scanning electron microscopy (SEM), differential scanning calorimetry (DSC), Fourier transform spectroscopy(FT-IR) and real time synchrotron wide-angle X-ray scattering (WAXS) . Multi-walled CNTs were co-electrospun with the poly(lactides) in weight ratios ranging from 0.1 to 4.0 wt% MW-CNT. PLA/carbon nanotubes composite electrospun fibers were successfully produced by appropriate choice of processing conditions and solution concentration. The morphologies of neat and CNT-filled electrospun nanofibers were observed by scanning electron microscopy. WAXS and DSC results show that lower content of CNTs contributes to higher speed of crystallization. However the results also showed that at the highest concentration of CNTs the ultimate crystallinity was reduced. FTIR and X-ray results show that PLA fibers have different crystal forms at high and low crystallization temperature. DSC results also show that D-lactide has reduced crystallinity compared to L-lactide.

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