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An unusual route to develop poly(lactic acid) based materials with deformation-recovery properties SAHAS RATHI, DAVID NG, E. BRYAN COUGHLIN, SHAW HSU, University of Massachusetts Amherst, CHARLES GOLUB, GERALD LING, MIKE TZIVANIS, Saint Gobain — A novel method based on co-crystallizing polymer blends was developed to obtain Poly(lactic acid) (PLA) based materials with deformation recovery properties. Two sets of blends were studied. One based on the PDLA-soft polymer-PDLA triblock copolymer and PLLA, where D and L refer to the two chiral isomers of PLA, while the other was based on homopolymer blends of PDLA/soft polymer/PLLA having identical chemical composition. The mechanical properties and morphological features of the two sets of blends were completely different. The triblock copolymer/ PLLA blends gave rise to flexible, tough semicrystalline materials while the corresponding homopolymer blends exhibited very low strains at break and high dissipative/dampening properties. The drastically different stereocomplex crystallization kinetics in the two sets of blends led to interspherulitic segregation of the amorphous chains in the triblock blends while intraspherulitic segregation occurred in the homopolymer blends. The presence of significant connectivity between the stereocomplex crystallites formed, in the triblock copolymer/ PLLA blends, was important for the deformation shape recovery characteristics observed. In addition, it was found that the use of ether-ester based plasticizers significantly reduced the glass transition temperature and enhanced the recovery property of the triblock copolymer based PLA blends.

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