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Preparation of Electrospun PLA/ENR Fibers

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Abstract : Electrospinning is a technique for the fabrication of nanoscale fibers. The general electrospinning system consists of a syringe filled with polymer solution, a syringe pump, a high voltage source and a grounded counter electrode. During electrospinning a volumetric flow is set by the syringe pump and an electric voltage is applied. This forms an electric potential between the needle and the counter electrode (collector plate), which results in the formation of a Taylor cone and the jet. The jet is moved towards the lower potential, the counter electrode, wherein the solvent of the polymer solution is evaporated and the polymer fiber is formed. On the way to the counter electrode, the fiber is accelerated by the electric field. The bending instabilities that occur form a helical loop movements of the jet, which result from the coulomb repulsion of the surface charge. Trough bending instabilities the jet is stretched, so that the fiber diameter decreases. In this study, a thermoplastic/elastomeric binary blend of non-vulcanized epoxidized natural rubber (ENR) and poly(latic acid) (PLA) was electrospun using polymer solutions consisting of varying proportions of PCL and NR. Specifically, 15% (w/v) PLA/ENR solutions were prepared in /chloroform at proportions of 5, 10, 25, and 50% (w/w). The morphological and thermal properties of the electrospun mats were investigated by scanning electron microscopy (SEM) and differential scanning calorimetry analysis. The SEM images demonstrated the production of micrometer- and sub-micrometer-sized fibers with no bead formation. The blend miscibility was evaluated by thermal analysis, which showed that blending did not improve the thermal stability of the systems.

Keywords : epoxidized natural rubber, poly(latic acid), electrospinning, chemistry
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