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Properties-morphology relationships in electrospun mats based on polylactic acid and graphene nanoplatelets

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Abstract

Aligned and randomly oriented polylactic acid (PLA) biocomposite nanofiber mats filled with Graphene nanoplatelets (GnP) were prepared by electrospinning. The morphological analysis revealed the successful alignment of the fibers achieved by collecting the mats on a high-speed rotary drum. Furthermore, GnP addition on the polymeric solution leads to an increase of the viscosity with a consequent increment of the fiber diameter. Tensile tests demonstrated that the reinforcing effect of GnP when added to the PLA matrix was more than three times higher in the aligned systems if compared with the respective randomly oriented mats. DSC analysis showed that GnPs were able to slightly increase the crystallinity of the composites acting as nucleating agent. TGA measurements highlighted that the incorporation of GnP in PLA electrospun mats leads to an improved thermal stability of the composites. Both thermal analysis indicate that there is no significant effect of the orientation of the fibers.

Keywords: A. Multifunctional composites; A. Graphene; B. Mechanical properties; E. Electrospinning

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