Study of chain segment mobilities at the interface of semi-crystalline polylactide/clay nanocomposites

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Abstract

This work reports new experimental results focused on polylactide/clay nanocomposites using PBAT as coupling agent [1]. The samples have been accurately characterized by different experimental techniques: XRD, TEM, TGA, standard DSC and MT-DSC with the aim to highlight the effect of lamellae dispersion and distribution at nanoscale onto the thermal features of resulting nanocomposites. We show that the presence of different interaction levels at the interface PLA/OMMT, even tuned by the presence of PBAT, affects both the crystalline phase structure (by differently promoting crystallization of a and a' forms) and the distribution between the amorphous fractions (rigid and mobile). Furthermore, we show that the cooperativity degree obtained from MT-DSC is a powerful complementary tool to X-Ray diffraction and microscopy when investigating the morphology of nanocomposites since it probes the physical interactions between the matrix and the filler. When the dominant morphology of the nanocomposite is exfoliated, the interfacial interactions between the matrix and the filler increase the cooperativity. On the other hand, intercalated morphology renders less effective the formation of physical bonds due to the confinement of the macromolecules in the galleries of fillers, decreasing hence the cooperativity degree.

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