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Role of organoclay in controlling the morphology and crystal-growth behavior of biodegradable polymer-blend thin films studied using atomic force microscopy

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Abstract

This study reports the effect of organically modified nanoclay on the morphology and crystal growth behavior of biodegradable polylactide/poly[(butylene succinate)-co-adipate] (PLA/PBSA) blend thin films with the average thickness of 280 nm. The neat and organically modified blended thin films were cast on silicon (001) substrate using a spin coater. Blended composite thin films with three different types of organically modified clays were prepared, and the impact of the nature of the pristine clays, their organic modifications and their initial d(sub001)-spacing on the morphology and crystal growth behavior of the PLA/PBSA blend were studied. An atomic force microscopy equipped with a hot-stage scanner was used to examine the crystalline morphology of the thin films. The morphology and crystal-growth behavior of the films were investigated during in situ annealing and cooling from melt. The results indicated that the initial d(sub001)-spacing of the organoclay plays a pivotal role in controlling the morphology of the dispersed phase and hence the crystal-growth behavior.