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Unique Cold-Crystallization Behavior and Kinetics of Biodegradable Poly[(butylene succinate)-co adipate] Nanocomposites: A High Speed Differential Scanning Calorimetry Study

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Abstract

The poly[(butylene succinate)-*co*-adipate] (PBSA) nanocomposites (PBSANCs) with five different loadings of organoclay were prepared by melt-blending. The morphological investigation revealed that the degree of dispersion of silicate layers in the PBSANCs changes from well-delaminated to intercalated and subsequently to stacked intercalated-flocculated when the organoclay loading increased from 3 to 6 wt.-%. This observation was supported by the melt-state rheological property measurements. The effect of such structural changes on the cold-crystallization behavior and kinetics of PBSANCs were investigated using a high-speed DSC. Surprisingly, the DSC thermograms revealed that the characteristic cold-crystallization peak of neat PBSA shifts towards higher temperatures for the PBSANCs and that the kinetics for the crystallization of the matrix retarded in the PBSANCs. This is not consistent with the general understanding of the role of dispersed silicate layers towards semicrystalline polymer cold-crystallization. The presence of well-dispersed intercalated silicate layers explains the observed cold-crystallization behavior and the retarded non-isothermal cold-crystallization kinetics of the PBSANCs.