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Reactive Extrusion: A Useful Process to Manufacture Structurally Modified PLA/o-MMT Composites

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Abstract

In the present work, Poly(lactic acid) (PLA) sheets reinforced with organically modified montmorillonite (o-MMT) were manufactured through reactive extrusion-calendering using a masterbatch approach in a pilot plant. Reaction monitoring analysis suggests the occurrence of premature reactions between o-MMT and the reactive agent; lowering further structural changes in the polymeric matrix. While calendered sheets exhibited a homogenous and preferential distribution of clay particles in MD, the coexistence of mixed structures, involving tactoids of various sizes as well as intercalated clay layers was observed. However, a higher and finer dispersion of o-MMT particles was achieved through clay-polymer tethering via chain extender molecules. Under tensile loading, the aforementioned clay dispersion enhanced multiple cavitation processes, notably improving PLA shear flow.

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