

Structure–property relationship in PP/LDPE blend composites: The role of nanoclay localization

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ABSTRACT:

This article reports, for the first time, on how the kinetics and thermodynamics of the melt-processing control the nano/micro-structure development and properties of nanoclay-filled polypropylene (PP)/low-density polyethylene (LDPE) blend ternary composites. Morphological characterization suggests that the nano/micro-structure of the PP/LDPE (80/20) blend can be controlled by incorporating nanoclay alone or by adding a mixture of organoclay and maleated compatibilizers. Simultaneous mixing of PP, LDPE, maleated compatibilizers, and organoclay results in homogeneous distribution of intercalated silicate layers in all the phases of the blend, a feature which profoundly affects the thermal stability and tensile and rheological properties of the blend composites. For example, the elongation-at-break for PP increases from 28.1 to 155.6% for composite containing both organoclay and maleated compatibilizers, whereas the thermal stability for PP increases from 269.8 to 303.3 °C for the same composite. However, the impact strength of the PP/LDPE blend decreases with incorporation of organoclay, regardless of the phase in which the nanoclay particles are localized. In summary, the obtained results show that regardless of the phase in which the nanoclay is localized, the morphology, and hence the properties, of the ternary composites are superior to those of the neat blend.