Effect of core–shell rubber toughening on mechanical, thermal, and morphological properties of poly(lactic acid)/multiwalled carbon nanotubes nanocomposites

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ABSTRACT

The effect of core–shell rubber (CSR) toughening on mechanical and thermal properties of poly(lactic acid)/multiwalled carbon nanotubes (PLA/CNT) nanocomposites were investigated. The nanocomposites were prepared by direct melt blending method in a counter-rotating twin-screw extruder. The contents of CSR were varied between 5 and 20 wt % while the content of CNT was kept at 5 phr. The extruded samples were injection molded into the desired test specimens for mechanical and thermal properties analysis. The impact strength of PLA/CNT increased with increasing CSR content with concomitant decrease in tensile strength and modulus. Interestingly, the flexural strength increased at low CSR content before decreasing at 15 and 20% content. Differential scanning calorimetry analysis on the second heating cycle shows no crystallinity content for PLA/CNT and all CSR toughened PLA/CNT nanocomposites, while thermogravimetric analysis shows lower thermal degradation of all CSR toughened PLA/CNT as compared to PLA/CNT nanocomposite. This study reveals significant correlation between CSR loading with the mechanical and thermal properties of the nanocomposites.

KEYWORDS

Biodegradable; Extrusion; Fullerenes; Graphene; Morphology; Nanotubes; Thermal properties

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