

Mechanical Properties and Biodegradability Studies of HDPE-PLLA Blended Packaging Films

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ABSTRACT

The blends of high density polyethylene (HDPE), known to be a non-biodegradable polymer and Poly(L-lactide) (PLLA), which is biodegradable one, were prepared in various compositions to develop partially biodegradable packaging films. The blends were prepared with/without the traces of maleic anhydride (MA), which acts as compatibilizer between HDPE and PLLA. The content of PLLA was varied from 0 to 20% in the blends, while that of MA from 0 to 8%. The blend compositions were optimized for tensile properties as per ASTM D 882-91. On this basis, 80 wt % HDPE and 20 wt % PLLA and 4 wt% MA was found to be an optimum composition. Mechanical properties and weight changes were determined before and after composting. Tensile strength of the blends decreased following the increasing the PLLA content, but increased in elongation at break. The dispersion of PLLA in the HDPE matrix increased with the addition of compatibilizer. The increasing amount of the compatibilizer also increased the crystallinity of PLLA. The biodegradability of the blends were studied under controlled composting conditions was investigated according to modified ASTM D 5338 (2003). The (bio)degradation studies under different pH of compost revealed that alkaline condition(s) and the presence of compatibilizer favor the degradation of the blends. The partial biodegradable blended films may be used for packaging application.

Key Words: HDPE, PLLA, blends, UTM, biodegradation

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