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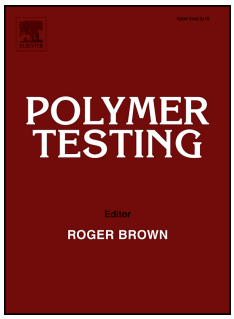

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Biodegradability studies of poly(butylene succinate) composites filled with sugarcane rind fiber

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Abstract: Biodegradable composites were prepared from poly(butylene succinate)(PBS) and sugarcane rind fiber (SRF) by melt blending. The effects of SRF content and burial time on the biodegradability of SRF/PBS composites were investigated. Soil burial experiment was lasted 100 days under natural soil conditions. The biodegradability of pure PBS and SRF/PBS composites was evaluated by analyzing weight loss, mechanical properties, morphological properties, melting and crystallization behavior and thermal stability after the soil burial test. The weight loss and the mechanical property loss ratio of SRF/PBS composites were higher than that of pure PBS, and reached a maximum value when the SRF content was 5wt% after soil burial for 100 days. Scanning electron microscopy (SEM) suggested that the degree of erosion of the composites was higher than that of the pure PBS. Differential scanning calorimetry (DSC) and thermogravimetric analysis (TG) showed an increase in crystallization temperature(T_c), degree of crystallinity(χ_c) and maximum weight loss rate temperature(T_{max}) after soil burial for 100 days except for the 5wt% SRF/PBS composites. It is indicated that 5wt% SRF addition had the maximum impact on the accelerated degradation of PBS.

Keywords: Poly(butylene succinate); Sugarcane rind fiber; Biodegradability; Soil burial

1 Introduction

The environmental pollution and energy shortage have taken a grave turn leading to a significant research emphasis on the development and applications of environment-friendly materials[1-4]. Aliphatic polyesters have been widely recognized as environment-friendly polymers. Poly(butylene succinate) (PBS) is one of the most promising aliphatic polyesters, due to its good processability, thermal properties, biodegradability and compostability [5-9]. However, the poorer mechanical properties and the higher price compared with conventional polymers limit its large scale applications[10-13].

The natural fibers are normally employed to replace the synthetic fibers as reinforcing agents and fillers because of their easy accessibility, low prices, reproducibility, and good biocompatibility [14-18]. In recent years, various natural fibers such as silk fiber [19], sisal fiber [20], jute fiber [21],rice-husk flour [22],bamboo [23],corn starch [24] and sugarcane bagasse fiber [25] have been incorporated into PBS for enhancing mechanical properties, thermal properties, crystallization properties, and degradation properties. The sugarcane has an enormous annual

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