P-12-997

MECHANICAL PROPERTIES OF POLY(3-HYDROXYBUTYRATE)-BASED MATERIALS

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For the last ten years, lots of efforts have been spent towards the development of biodegradable polymers as substitutes for common non biodegradable synthetic polymers to minimize environmental problems caused by ordinary plastics. In particular, Poly(3-hydroxybutyrate) (PHB), a biodegradable polyester that is synthesized in bacteria as a storage material has attracted some attention in Brazil, as it can be produced from sugar cane molasses. Besides being biodegradable, PHB is biocompatible and originates from renewable sources. However, its high cost, brittleness and difficult processability has prevented its use in a large scale. Particularly, one of the reasons for the remarkable low toughness, besides high degree of crystallinity, is the progressive crystallization wich deteriorates the mechanical properties with time. In order to minimize these drawbacks, it is possible to blend it to other polymers or to incorporate additives such as plasticizers. In this work, PHB with plasticizer Tri(ethylene glycol) bis(2-ethylhexanoate) [TEG(EH)] and a blend of PHB and Poly(ethylene-co-methyl acrylate-co-glycidyl methacrylate) [PEMAGMA] were obtained by melt mixing in optimized processing conditions. The tensile properties of the materials were evaluated over time and explained in light of the morphology of the same. Several annealing conditions were then applied in order to reduce the effect of ageing. The results showed that the incorporation of the copolymer PEMAGMA or plasticizer TEG(EH) into the PHB matrix, combined with the annealing process, improves significantly the toughness.