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Abstract

The work describes development of the new polyester materials being polymer blends based on poly(3-hydroxybutyrate), P3HB and multiblock copolyesters containing monomers from renewable resources, including succinic acid (PBS) and dilinoleic acid derivative (DLA) - (P3HB/PBS:DLA), as well as the evaluation of selected properties of the obtained blends affecting their processing. The polymer blends were obtained as a result of the mixing process by extrusion in the molten polymer mass. The influence of the different amount (5, 10 and 20 wt.%) and the segmental composition of multiblock copolyesters (ratio of hard, PBS (W_h) to soft segments, DLA (W_s), 70:30 wt.% (PBS:DLA_70) and 50:50 wt.% (PBS: DLA_50 respectively)) on physical properties, phase structure and morphology as well as properties related to the flow and mechanical process of P3HB were investigated.

Moreover, the research to develop a chemical compatibiliztion process for one from the obtained blends based on P3HB, i.e. P3HB/PBS:DLA_70 ($80/20_{70}$), as well as chemical modification process of the initial components of this mixture (P3HB and PBS: DLA_70) has been performed. The processes were carried out by reactive extrusion with the selected amount of maleic anhydride (MA) - 5 wt% and the initiator, dicumyl peroxide (DCP) - 0.5 wt.%. The influence of the applied amount of MA and DCP on the compatibilization process of $80/20_{70}$ blend as well as modification of its components (P3HB and PBS:DLA_70) was investigated based on chemical and physical properties as well as phase structure and morphology and properties related to the flow and mechanical processes.

It has been shown that increased interactions affecting the miscibility of polyester materials being polymer blends based on P3HB (P3HB/PBS:DLA) can be obtained by using the appropriate amount and segmental composition of multiblock copolyesters (PBS:DLA) with respect to P3HB, due to plasticizing and lubricanting effect of used copolyesters. Furthermore, it has been shown that the chemical compatibilization process of the P3HB/PBS:DLA_70 ($80/20_{70}$) blend may lead to the formation of grafted copolymers P3HB-g-PBS:DLA_70, fulfilling the role of compatibilizers and/or PBS:DLA_70-g-MA, the

presence of which may be the reason for the increase in mutual interactions between the components in the blend and what can be proved by the improvement of phase properties associated with the flow and mechanical processes for the blend P3HB/PBS:DLA_70 ($80/20_{70}$).

It has been demonstrated that it is possible to broaden the P3HB processing window, which is reflected in the improvement of its processing and mechanical properties, according to the development of the extrusion process of polyester materials being polymer blends based on P3HB and multiblock copolyesters containing monomers from renewable resources, including succinic acid (PBS) and dilinoleic acid derivative (DLA) as a result of the different amount and segmental composition of copolyesters (PBS:DLA). It is also possible to further improve the interaction between components of the P3HB/PBS:DLA_70 ($80/20_{70}$) blend, leading to an improved rheological-mechanical characteristics, extremely important in the processing of materials based on P3HB.

Key words: poly(3-hydroxybutyrate) (P3HB), multiblock copolyesters (PBS:DLA), polymer blends, chemical compatibility, maleic anhydride (MA)

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