CHARACTERIZATION OF MORPHOLOGICAL, THERMAL AND MECHANICAL PROPERTIES OF BIOPOLYMER BLENDS

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ABSTRACT

Polymers, which can be produced from raw materials of the agricultural production chain or by the action of microorganisms and which are biologically degradable gain increasing importance due to the public demand for saving fossile raw materials and recycling short-lived products[1,2]. Nevertheless, such biological and/or biodegradable polymers have to fulfill the same specifications in terms of their thermal, mechanical and end-use properties as the standard plastics which presently dominate the world market. Thus, to fully exploit the potential of this new class of polymers, intense research efforts are necessary in order to support their fast industrial development and bring them to market maturity.

The present communication reports results of different investigations of the important class of poly(hydroxyalkanoates)[2] with the goal to contribute to the improvement of their thermal and mechanical properties and to optimize their processing conditions. Thus, investigations by the combination of thermogravimetric analysis (TGA), differential thermal analysis (DTA) and FT-IR spectroscopy have been performed to study the thermal degradation of poly(3-hydroxybutyrate) (PHB), its copolymers and polymer blends in oxygen and nitrogen atmosphere[3,4], respectively. Furthermore, PHB and P(HB-co-HHx) have been investigated by variable-temperature FT-IR spectroscopy. From these data a quantitative measure of the state-of-order variation during heating and cooling could be derived. Another topic which will be addressed are simultaneous mechanical and FT-IR spectroscopic (so-called rheo-optical) measurements of PHB blends to study the evolution of anisotropy and structural changes during mechanical treatment[5]. In view of the necessary improvement of the mechanical properties of PHAs and their blends in competition with standard polymers the application of this technique plays an important role for a better understanding of their structure-property correlation. Finally, FT-IR imaging data using a focal plane array detector will be discussed in terms of the phase separation behaviour of PHB blends with other polymers[6,7].

References:

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