

Unconventional Methods for Processing of Thermal Sensitive Poly (hydroxy alkanooates) – Solid State Processing and SC/PL Foaming

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Poly (hydroxy alkanooates) (PHA) which can be synthesized from renewable sources by help of specific types of bacteria belong to the biodegradable semi-crystalline polyesters. Poly (3- hydroxy butyrate) (PHB) as well as poly (3-hydroxy butyrate-co-3-hydroxy valerate) (PHBco-HV) are the most produced and investigated products under the PHA. Unfortunately, their melt-processing behavior is connected with a strong molecular degradation and loss of important mechanical properties. To avoid the strong degradation of PHA during processing new routes have been developed to generate compact or porous materials, respectively. For the production of compact parts a two step solid state processing route was realized: Production of a “green” body by cold compaction of PHB powder at room temperature, and extrusion of this “green” body under plain strain compression in a channel die below the melting temperature of the crystalline phase of PHB. This procedure leads to products with a high level of mechanical properties. Structure and properties of solid-state processed PHB are discussed in dependence on the molecular parameters and processing steps. Furthermore, a foaming process is presented which avoids strong thermal exposure, i.e. essential degradation and property loss, but guarantees the manufacturing of foamed PHA parts with definite macro-porous structure and sufficient mechanical properties. The route is a non-thermal procedure characterized by the use of a solution casting/particle leaching (SCPL) technology. The influence of the material components and processing parameters on the structure and properties of PHB foam is discussed.