Pieter Samyn et al., J Material Sci Eng 2015, 4:4
http://dx.doi.org/10.4172/2169-0022.S1.022

OMICS International
conferenceseries.com

International Conference and Exhibition on
Biopolymers & Bioplastics
August 10-12, 2015 San Francisco, USA

Formulation and characterization of PHB/NFC blends for potential thermoforming applications

Pieter Samyn, Tilmann Herberger and **Vibhore K Rastogi**
Freiburg University, Germany

The thermoforming market is growing fast and many thermoforming applications such as one way packaging and food packaging, are interesting for biopolymers. Therefore better insights into the usability of biopolymers for thermoforming are needed. It has been found out that good control on the crystallization process is a key aspect in thermo-forming. The polyhydroxybutyrate (PHB) is one biopolymer, which deserves attention, because it is decently thermoformable while it has still a big potential for further optimization. Two drawbacks in thermoforming of PHB, i.e. the high brittleness and low thermal stability, can be improved by controlling its crystallization behavior. On the other hand, nanofibrillated cellulose (NFC) offers high potential as fillers providing enhanced mechanical properties; however, they may also influence the crystallization kinetics of the polymer blends: in general, the fibers are inducing a more homogenous and faster crystallization in a polymer. In this work, the effects of NFC additives on PHB blends are studied by considering the crystallization properties. As there is no established process for the compounding of NFC with PHB, a new way for compounding has been developed. For three different grades of PHB homo- and copolymers, the effects of NFC concentrations have been evaluated at various percentages of 0, 0.25, 0.50, 0.75 and 1 wt.-%. As a reference, the effects of a commercial nucleating agent on the thermal properties of the blends are compared. The resulting batches are characterized by thermo-analytical methods and spectroscopy. A screening for eventually remaining chemicals from the compounding process confirms that the nanocomposite batches were successfully compounded. Furthermore, the crystallization rate and amount of crystallinity of PHB/NFC blends were influenced and optimized by varying the concentration of NFC. The NFC increases the crystallization rate of PHB but there is only a slight change in the amount of crystallinity. The manufacturing process has a slight influence on the thermal properties, but the change has no negative effects on the materials quality for thermoforming.

Biography

Pieter Samyn completed his PhD in Materials Science and Engineering at Ghent University (2007) and took several Post-doctoral research projects at Department of Textiles (Ghent), Department of Microscystems Engineering (Freiburg) and was visiting Professor at the Pulp and Paper Institute (Toronto). He is currently a Robert-Bosch Junior Professor at the University of Freiburg working on the processing of bio-based nanocomposites for coatings and structural applications. He has published more than 150 papers in the field of tribology, adhesion science and paper surface modification. He received a Heinz-Meier Leibnitz Price (2012) as excellent young researcher.

pieter.samyn@fobawi.uni-freiburg.de

Notes: