11th International Conference
on Advanced Materials
Rio de Janeiro Brazil
September 20 - 25
ICAM2009

Molecular weight studies in biotechnologically PHB to develop a new PHB-PLA material

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Abstract.

Recently, the transformation of renewable raw materials in bulk chemical has been improved as an object of major research and technological developments around the world. It was estimated that actually 150 millions of tons of polymers are produced from fossil fuel and the production is increasing 4-5% per year. The interest in the use of renewable resources occurred due to the continuous depletion of fossil resources, which are estimated to be fully consumed in an immediate future. Additionally the growing use of fossil raw materials is followed by an increase CO_2 emission in the atmosphere, a greenhouse with a high negative environmental impact.

The production of biodegradable biopolymers as Polyhydroxyalkanoates (PHAs) by biotechnological methods is an interesting alternative as a substitute of polymers derivate from fossil fuel. In addition, is important to improve the PHAs copolymerization properties with the propose of extending their field of application, while keeping biodegradability.

In this study, we have investigated several strategies to enhance properties of Polyhydroxybutyrate (PHBs) obtained from *pseudomonas fluorescens* including blending high-molecular weight PHB with Polylactic acid (PLA, sigma) and copolymerization of an enzymatically produced low molecular weight PHB with PLA. The physical and chemical properties of Polyhydroxybutyrate (PHB) and polylactic acid (PLA) were evaluated. A blend of PHB and PLA was produced by dissolution and the properties were evaluated.

The enzymatic hydrolysis was used as a technique for PHB molecular weight modification. A reduction in PHB molecular weight from $5{,}28X10^5$ Da to $6{,}75X10^2$ Da was obtained. Enzymatically treated was further used to perform a PHB - PLA copolymerization. The properties of a new mixture were evaluated as a function of the molecular weight of the polymer in order to explore a new application for the material synthesized.

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