EFFECTS OF THE BIODEGRADATION ON BIODEGRADABLE POLYMER BLENDS AND POLYPROPYLENE

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ABSTRACT
The large use of plastics in the world generates a large amount of waste which persists around 200 years in the environment. To minimize this effect is important to search some new polymer materials: the blends of biodegradable polymers with synthetic polymers. It is a large area that needs an intensive research to investigate the blends properties and its behavior face to the different treatments to aim at the biodegradation. The blends used in this work are: some biodegradable polymers such as: poly(hydroxybutyrate) (PHB) and poly(ε-polycaprolactone) (PCL) with a synthetic polymer, polypropylene (PP), in lower concentration. These blends were prepared using an internal mixer (Torque Rheometer), and pressed. These films were submitted to fungus biotreatment. The films analyses will be carried out by Fourier Transform Infrared (FTIR), UV-Vis absorption (UV-Vis), Scanning Electronic Microscopy (SEM), DSC and TGA.

1 INTRODUCTION
From the last decade of 20th century one of the rapidly growing areas for the use of plastics is packaging. Convenience and safety, low price and good aesthetic qualities are the most important factors determining rapid growth in the use of plastics for manufacturing of packing. Recently, out of total plastic production, 41% is used in packing industries, and 47% of them is used for the packing of foodstuffs [1]. These are generally made from polyolefins (e.g. polypropylene (PP), polyethylene (PE)), polystyrene (PS), poly(vinyl chloride) (PVC), etc., are mostly produced from fossil fuels, consumed and discarded into the environment, ending up as spontaneously undegradable wastes. That means, amounting to 40% of packaging refuse, is practically eternal, and the question of what to do with plastics refuse is becoming a global environmental problem, Ray and Bousmina [1]. To minimize this effect is important to search some new polymer materials: the blends of biodegradable polymers with synthetic polymers. It is a large area that needs an intensive research to investigate the blends properties and its behavior face to the different treatments to aim at the biodegradation. The blends used in this work are: some biodegradable polymers such as: poly(hydroxybutyrate-co-valerate) (PHB-V) and poly(ε-polycaprolactone) (PCL) with a synthetic polymer, polypropylene (PP), in lower concentration. These blends were prepared using an internal mixer (Torque Rheometer), and pressed. These films were submitted to fungus biotreatment. The films analyses will be carried out by Fourier Transform Infrared (FTIR), UV-Vis absorption (UV-Vis), Scanning Electronic Microscopy (SEM), DSC and TGA.

2 PROCEDURE
In this work, the blends were prepared using biodegradable polymers such as PHB-V or PCL (80wt%) and PP (20wt%) (homopolymer and copolymer) as synthetic polymer in a internal mixer (Torque Rheometer) and pressed. The films obtained were submitted Biotreatment using *Phanerochaete chrysosporium Burds* for 4 months.

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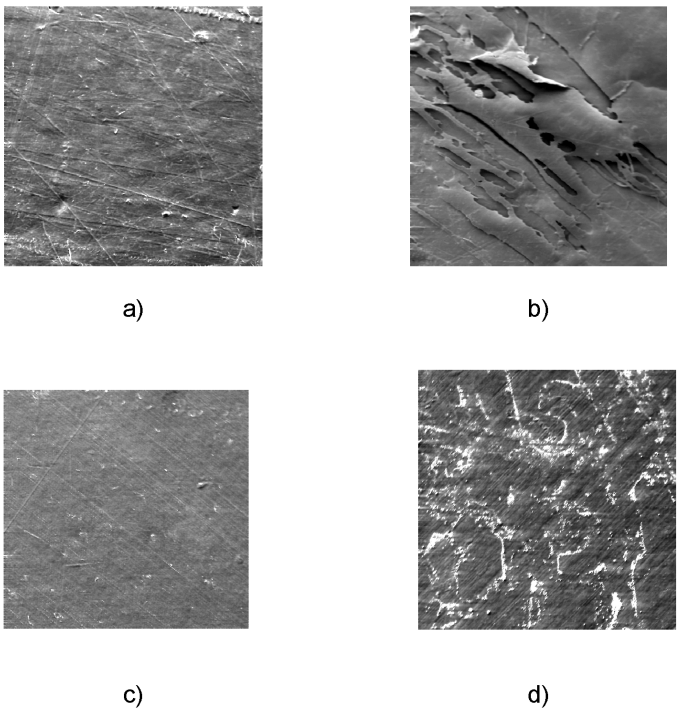
3 RESULTS

The Fig.1 presents SEM micrographs of the blends before and after biotreatment using *Phanerochaete chrysosporium Burds* for 4 months



a) b)

c) d)

Figure 1: SEM micrographs of blends a) PHB/PP (x200) and e) PCL/PP (x200), before the biotreatment and c) PHB/PP (x200), g) PCL/PP (x200) after biotreatment for 4 months.

4 CONCLUSIONS

Analysing the results of SEM we can note macrophasis morphological modifications. In the blends using PHB, as a biodegradable polymer, is possible to see degradation by layers.Results of FTIR provided us more informations about the structural changes after the biotreatment, for example, PCL presents these modifications between 1400-1000cm^{-1}.We also can see a variation to TG peaks to more high temperature after biodegradation for PHB-V/PP homopolymer blends and for PP homopolymer in the PCL/PP blends. We suppose that these variations in the temperature of the TG peaks can be because the modification in the crystallinity of these blends with the biotreatment. These results can be noted in the DSC analysis too. Other studies have been done about the biodegradation of these polymer blends and other kinds of polymers studied by our research group, Campos et al [2].

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