ABSTRACT

Due to the growing state of environmental pollution from plastic waste, biodegradable polymers are gaining popularity to help reduce the amount of trash. At the moment, there is a lot of research into new, but also existing polymeric plastics that can successfully replace plastics made from raw materials derived from petroleum processing, such as polypropylene (PP). An example of such a plastic could be polylactide, which, despite being used in industry for many years, has not been fully understood. Many research centers are conducting studies on the degradation of products based on this polymer, which, depending on the form of the final product, give different results. Therefore, this dissertation undertook to analyze the process of hydrolytic degradation of fibers from PLA contained various amount of D-lactide isomer, with particular attention to the occurring changes in the molecular and supramolecular structure of the fiber material.

The fibers were subjected to hydrolytic degradation at 90 °C, in different incubation media, with pH 3.5, 5 and 10. The degradation was carried out within a specified time frame which allow to estimate of degradation kinetics. The obtained samples after degradation were analyzed using instrumental analytical methods. In the first stage of the work, macroscopic and microscopic evaluation of the degraded fibers was carried out, and the kinetics of the degradation rate was determined based on the evaluation of weight loss and the evaluation of the change in essential viscosity. In addition, the analysis of structure changes at the molecular and supramolecular level was carried out by: Fourier Transform Infrared Spectroscopy (FTIR), Wide-Angle X-ray Diffraction (WAXD) and Differential Scanning Calorimetry (DSC).