Abstract

Biopolymer openwork structures with potential applications in environmental engineering

The scientific aim of this doctoral thesis was to determine the correlation between the parameters of the electrospinning process of biodegradable materials and the morphology of the obtained products. This goal was achieved by determining the range of all process parameters and their optimization to obtain a material with controlled morphology, in particular characterized by a developed fiber surface (presence of pores). The work used the solution of commercially available poly(lactic acid) – PLA 3052D, in chloroform due to the commonness of the media and the economic aspect of the possible further use of official alternatives. The diversified, time-stable morphology of the products obtained under repeatable conditions resulted in a wide range of their physical properties, which allowed the preparation of materials with the desired characteristics, depending on the end-use concept (so-called "tailor-made material").

As part of the work, the polymer solutions used were characterized, then the electrospinning process was carried out and the obtained structures were subjected to tests such as: surface morphology analysis (SEM), capillary rise measurement, porosity assessment using the gravimetric method, test of the resolving power for suspensions of microorganisms, microbiological filtration of indoor air, test of the sorption capacity of petroleum products and the biological decomposition test using the OxiTop method. The research results confirmed that the obtained structures have the potential to be used in technologies related to environmental engineering, and in particular they fill the research gap in the use of structures made of biodegradable biopolymers in filtration, separation and sorption processes.