AN ABSTRACT OF DOCTORAL DISSERTATION

"SURFACE FUNCTIONALIZATION OF TEXTILE FABRICS WITH SUPRAMOLECULAR POLYMERS AND COPOLYMERS WITH DIFFERENT TOPOLOGY BASED ON POLYLACTIDE FOR BIOMEDICAL APPLICATION"

In the dissertation a thesis assumes that it is possible to produce a hybrid system or composite in which the biodegradable polylactide and its copolymers of different topology will be deposited in a durable way on the ground of conventional textile material made of cellulose fibers. The work was to show that the functionality of the polylactic layer connected to cellulose material is the same as in the case of a polylactide system and the created composite is useful in regenerative medicine. For this purpose, conducted studies confirmed the mechanism of the physicochemical process of polymerization on the cotton surface, polylactide deposition and its copolymers on cellulose fibers depending on the type of initiator or catalyst for the process of grafting PLA.

Textile surfaces have been functionalized with biodegradable materials consisting of polymers and copolymers of various topologies, containing polylactide and additionally crossed by stereocomplexation. In the proposed innovative method polylactide and polylactide copolymers form a top layer on cellulose fiber textiles. In the first stage, the work focuses on the modification of the surface properties of the cellulose substrate, followed by polylactide co(polymers) functionalization, using methods with possible negative impact on the environment. As part of the compatibilization of the active polylactic layer with cellulose material, a binding of the substrate with a functional outer layer was designed. Additionally, the modification of thickness of the PLA layer on the substrate or its cross-linking by stereocomplexation, will be used to moderate the release of bioactive substances in the biologically active environment.

The work consists of 6 chapters. Chapter 1 is an introduction to the trial.

Chapter 2 presents a current summary of knowledge about cellulose and polylactide as materials useful in regenerative medicine. A large part is devoted to a review of methods for compatible and connecting both polymers, with particular emphasis on the conditions necessary to be met in the case of use on medical devices.

Chapter 3 is dedicated to the method of producing a cotton fabric surface-modified with lactide and a change in the properties of its surface from hydrophilic to hydrophobic was

assessed. The result of the modification is a polylactide layer, permanently connected to macromolecules of cellulose through hydroxyl groups. The results presented confirmed the presence of PLA on cotton and its short characteristics are added.

Chapter 4 discusses the active layer of the designed dressing, consisting of polylactides and polylactide copolymers of various topologies, which are to act as drug carriers, with anti -inflammatory drug (ibuprofen). The characteristics of the drug are given as well as the method of implementing the drug to the carrier and then the carrier to a modified cotton fabric. Finally, kinetics of releasing ibuprofen is determined from two selected samples, and the total amount of released IBU from the samples is presented.

Chapter 5 is devoted to cytotoxicity and anti -inflammatory properties of produced dressings. The results of biological tests on mouse and human fibroblasts are discussed in correlation with various methods of preparing dressings (in terms of pre-processing of cotton, polymerization of lactide and structure of the surface layer with an implemented drug).

Chapter 6 is a summary of all research and forecasts of further investigation.