The influence of mechanical behavior of nonwoven materials based on PHB in dependence to its microstructure

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Abstract. Polymer nonwoven materials for medical purposes, which can substitute the extracellular matrix, has been the promising object for tissue restorative therapy. The paper presents two technological approaches for several formulations of molding solutions of poly(3-hydroxybutyrate) (PHB) in chloroform. The considered technological solutions allow obtaining electrospun fibrous composites with various fiber morphologies, which cause significant differences in the physical-mechanical properties of nonwoven materials. The work is focused on the study of mechanical behavior of such scaffolds under loadings in wide range of conditions, including these static stresses that occur in a living organism.

It is shown that obtained nonwoven matrices with controlled structure and properties allow variation of mechanical properties and geometry of fibrous layer. The tensile strength of obtained materials varied in the range from 0,1 MPa to 1,3 MPa. The elongation at break of nonwoven matrices differed from 3 to 9%. These materials may be obtained with different porosity due to its technological process.

Research and development of new polymeric materials with controlled biodegradation rate and physical-mechanical properties has been under the discussion in this article. The process of degradation under the uniaxial tension in the bulk of ultrafine fibers was considered. The evolution of material's microstructure in the bulk of nonwoven materials based on PHB was detected using ultrasonic acoustic microscopy