The influence of microstructure in PHB nonwoven materials on mechanical behavior under the tensile.

A. Zykova[1*], P. Tyubaeva[2,1], E. Morokov[1], A. Olkhov[1,2,3], A. Popov[1,2]
[1]*Emanuel Institute of Biochemical Physics Russian Academy of Sciences, Kosygina street 4, 119334, Moscow, Russia, zykovaak@yandex.ru*
[2]*Plekhanov Russian University of Economics, Stremyanny per. 36, 117997, Moscow, Russia*
[3]*Semenov Institute of Chemical Physics Russian Academy of Sciences, Kosygina street 4, 119334, Moscow, Russia*

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Abstract. Polymer nonwoven materials are promising objects in tissue engineering and regenerative medicine, where polymer's scaffolds mimic extracellular matrix of tissue. Formation and investigation of artificial scaffolds with controlled microstructure and properties are the main issue in tissue engineering, however it is important not only characterized material in initial state but also to assess scaffold changes caused in a living organism by physiological conditions. One of them is mechanical stress. The work is focused on the study of mechanical behavior of nonwoven scaffolds under the tensile.

The results has been obtained in poly(3-hydroxybutyrate) (PHB) scaffolds prepared by two technological approaches and several formulations of molding solutions of PHB in chloroform. The technological solutions provide electrospun fibrous structures with various fiber morphologies, which cause significant differences in the physical-mechanical properties of nonwoven materials. Produced PHB scaffolds with different porosity and geometry of fibrous layer have tensile strength in the range from 0.1 MPa to 1.3 MPa and elongation at break from 3 to 9%. To visualize the evolution of the microstructure during the loading the two methods have been applied. Observation from the top surface has been done by optical microscopy. Step-by-step transformation of the microstructure in the volume has been visualized by high-frequency acoustic microscopy.

Influence of fiber size, packaging density and volume architecture on mechanical behavior of scaffolds under the tensile has been under the discussion in this work.

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