Step-by-step visualization of electrospun PLA mats elongation mechanism under the tension via acoustic microscopy

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Abstract.

The behavior of artificial scaffolds under load mimicking natural processes in the living organism is the most important parameter during the formation and selection of implants. Artificial materials with a high specific surface area and high porosity, which provide effective attachment of cells and the delivery of nutrients, have a great potential for the regeneration of connective tissue part of internal organs and skin. It is known that the biomechanical behavior of scaffolds has a significant effect on the process of primary postimplantation response to the material *in vivo*. Moreover, the mechanical characteristics also affect the subsequent adhesion, migration, proliferation and differentiation of cell cultures *in vitro* and *in vivo*.

The paper considers the tensile behavior of a non-oriented non-woven matrix based on poly-L-lactide. The process of alignment, orientation and stretching of individual fibers was revealed using acoustic and optical microscopy, the obtained data has a good agreement with mechanical characteristics investigation data upon uniaxial strain. At stresses close to the yield strength, multiple necks are formed on the fiber, which are well determined by ultrasonic methods due to the difference in the elastic properties of these areas from the main body of the fiber. Presumably, the formation of necks is due to the presence of fiber regions with low crystallinity of poly-L-lactide. The interposition of fiber regions with different supramolecular ordering will further allow us to evaluate the effect of faster degradable amorphous regions of poly-L-lactide on the evolution of the physicomechanical characteristics of fibrous materials during their biodegradation.

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