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MANUFACTURING AND ALIGNING THE PCL NANOFIBERS ALONG REQUIRED DIRECTIONS BY SWITCHING METHOD OF ELECTROSPINNING VOLTAGE FIELD FOR DESIGNING SCAFFOLDS IN TISSUE ENGINEERING

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ABSTRACT

Nowadays optimization of nanofibers web scaffold has been experienced in various scientific applications like biomedical prosthesis and scaffolds in which the nanofibers orientation and morphology in those of webs are important. Many attempts have been made to arrange nanofibers in horizontal or vertical directions for cell growing of special tissues such as tendon, ligaments, nerves, etc. In this research a novel method has been presented to control and arrangement pattern and orientation of nanofibers in required directions. For this reason a special collector set up was manufactured for electrospinning of nanofibers included control circuit and collector surface of parallel wires. The switching of parallel wires could be controlled by computer and controller circuit and could change arrangement of nanofibers collecting between collector wires. Also simulation software was written to model movement direction of nanofibers according to the field equations of electrospinning and switching pattern of collector wires. The prepared software could predict and model movement direction of nanofiber from nozzle to collector wires for various parameters of electrospinning. It was possible to change electrospinning parameters and find the optimum condition for any desired nanofibers orientation or pattern on collector. In the experimental part the nanofibers was modeled and produced with various switching patterns and the results of nanofibers orientation modeling and SEM images were compared to consider ability of switching set up of collector and reliability of simulation software. It was observed that results of modeling and experiments confirmed together. The presented method can simulate nanofibers web before production to save time and cost of scaffold preparation from electrospinning technique.

KEYWORDS: Orientation, Nanofibers, Electrospinning, Modeling, Simulation, Electric Field