ELECTROSTATIC MANUFACTURING OF POLYMERIC MATS MADE OF MULTILAYERED FIBERS

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Polymeric fibrous mats manufactured by electrostatic method are currently being studied intensively due to their potential applications in biomedical engineering and biotechnology. Because of their good mechanical properties, compact structure and large active surface area, they can be used as local drug delivery systems (dressings) or implants from which the drug substance is released in a controlled manner over a long period of time. However, currently designed systems have two major disadvantages. The first one is a small capacity of nanofibers for the drug (about 2-3% of the total system's weight). The second drawback is related to its release profile - more than half of the drug immobilized inside nanofibers is released in the first period of the polymeric mat usage. In order to improve both of these parameters, we propose manufacturing the mats that are spun with fibers with a multilayer structure made of different polymeric materials. The release rate of a biologically active material encapsulated within such mats would be controlled by proper selection of the thickness and structure of the outer layers covering the fibers.

The aim of the work is to elaborate a method for producing multilayered fibers by electrostatic method with the use of a coaxial nozzle of own design with a suitably selected polymers, as well as increasing the total volume of obtained systems.

The most important stages of the work are as follows: development of an electrospinning method for obtaining abovementioned fibers from at least two liquids in a parallel-flow system to produce mats with a predetermined layer structure; selection of proper core and shell polymers (type, concentration, solvent, additional components); selection of the thickness of the shell in terms of decreasing a drug release rate (model substance). A useful complement to the work would be to propose a mathematical description of the process of producing polymeric mats made of multilayered fibers.