Electrospinning, A Versatile Technique

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Electrospinning provides a simple and versatile method for generating ultrathin fibers from a rich variety of materials that include polymers, composites, and ceramics[1]. Electrospinning is one of the most used methods for nanofiber production in recent years. This process is based on the principle that the polymer solution or melt of a certain polarity is accelerated towards the counter electrode by applying a current from a source that applies a high voltage. With this method, fibers with radii ranging from micrometers to nanometers are obtained[2-3]. It has received a lot of attention over the past decade for its versatility in spinning a wide variety of polymeric fibers by electrospinning, as well as its consistency in producing fibers in the submicron range[5]. The properties of electrospun nanofiber mats are characterized by a wide pore diameter distribution, high porosity, effective mechanical properties, and specific biochemical properties. The large surface area/volume ratio of nanofibers combined with their porous structure supports cell adhesion, proliferation, migration, and differentiation[6]. Nanofibers with electrospinning method are actively used in many fields, including biomaterials and tissue engineering, due to their ability to be produced in micro and nano sizes, high surface area, small pore size, and the possibility of producing three-dimensional structures[7-8].

In our studies, biopolymer nanofibers are produced using the electrospinning technique, and the produced nanofibers are used in various application areas such as wound dressing, bone regeneration, and tissue engineering. In our work carried out in this context; Controlled drug release studies were carried out with nanofibers produced by using various drugs, and nanofibers with antibacterial properties were produced by using various essential oils, with the production of nanofibers containing melatonin, intra-abdominal adhesions, which are an important problem in surgeries, are prevented to a significant extent. In addition to electrospinning, various projects are being carried out on encapsulation studies, biofilm production, photopolymerization, and enzymatic surface modification of inorganic materials such as hydroxyapatite, silica, clay using lipase enzyme for use in areas such as food packaging, food transportation, fertilization in agriculture, and bioapplication.

Keywords: Electrospinning, nanofiber, biopolymer, encapsulation, biofilm, surface modification.

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