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Nanofibers for Tissue Engineering and Regenerative Medicine

N. Bölgen[1] and A. Vaseashta[2]
[1]*Chemical Engineering Department, Mersin University, Mersin, Turkey*
[2]*Institute for Advanced Sciences Convergence, and Int'l Clean Water Institute,NUARI, Herndon, VA USA*

Electrospinning is a process in which polymer fibers are produced with diameters down to the nanometer range through the action of an electric field imposed on a polymer solution/melt. Distinct properties that make electrospun nanofibrous materials unique are their high surface area, porosity, tensile strength and high extensibility. Indeed the size of the fibers down to nanometer scale make the final structures unique. And since the structure of the nanofibers is very similar to the extracellular matrix, many applications of them are proposed to be used in biomedicine especially for tissue engineering applications. Many polymers were used to prepare electrospun nanofibers including natural and synthetic ones. Poly(ε-caprolactone) (PCL) was used extensively in the tissue engineering field as a synthetic polymer and alternative to natural polymers. The relatively inexpensive production routes, FDA approval, tailorable biodegradability, biocompatibility and easy manipulation make this polymer promising for electrospinning applications. Therefore PCL based electrospun matrices were used in several tissue engineering attempts including skin, bone, vascular and nerve regeneration. This review summarizes the use of electrospun PCL nanofibers in tissue engineering and regenerative medicine applications.