NANOFIBROUS MATERIALS WITH ANISOTROPIC STRUCTURES DEPOSITED BY ELECTROSPINNING

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Abstract

Nanofibrous materials are very promising for tissue engineering thanks to similarities of their intrinsic structure with extracellular matrix (ECM). Properly selected biocompatible material or their blend converted into the nanofibers can improve formation of new tissues (skin, muscles, bone, etc.). Moreover, specially designed nanomaterials can satisfy requirements for directional migration and proliferation of seeded stem cells and help with formation of engineered 3D ECM with anisotropic structure (nerve or vascular tissues replacements for example). Nanofibrous materials with anisotropic properties are highly suitable for applications in electronic and optics as well. Our work deals with a production of nanomaterials by electrospinning (ES) which have uniaxially or multiaxially ordered inner structure. Review study of recent technical abilities of ES method modifications based on patents and scientific papers are presented. The most important principles useful for industrial production were tested in our laboratories. Theoretical backgrounds of uniaxially aligned nanofibers formation on a patterned collector with obtained practical results are shown. Advanced collector; designed with optimal parameters set; collecting nanofibers with extremely high orientation order parameter (higher than 97 %) is introduced. Material and anisotropic properties of nanofibrous layers are discussed in detail. Prepared materials in CPN laboratories are currently tested for biological properties and we believe they are very promising and ready for direct application.

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