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Electrospinning of Chitosan

Abstracts
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co-electrospinning or post-impregnation techniques [3,4]. Scaffolds provided a sustained release of PRGF, promoted MSC cell attachment and proliferation and enabled CAM angiogenesis.

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EFFECT OF POSITIVE AND NEGATIVE CHARGE APPLIED DURING ELECTROSPINNING ON SURFACE CHEMISTRY AND SELECTED PROPERTIES OF CHITOSAN NANOFIBERS

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The positive charge of D – glucosamine residues in chitosan amino groups helps to explain the majority of the material properties and influence on cellular response [1]. Electrospinning of chitosan carry on some difficulties due to the instability of the stream resulting from large repulsion force in polymer jet [2]. Additive of synthetic polymer molecules to the solution decrease the interactions between the chitosan chains and improves mechanical properties [3, 4]. Electrospinning with either positive or negative voltage can also tailor surface functionality [5]. We suppose that it also can affect on further surface modification of the fibers.

In order to evaluate charge effect in electrospinning process on polycaprolactone/ chitosan (PCL/Chit) surface chemistry and selected properties nonwoven with both, negative and positive charge were prepared. Polymer blends were prepared with two selected polymer ratio. In order to describe changes in surface chemistry XPS measurements are planed. To analyze surface properties contact angle measurement were performed. Surface topography, phase separation and charge distribution will be characterized by AFM imaging. To analyze differences in molecular structure of components FT-IR spectra and DSC measurement were done. Differences in fibers morphology were illustrated by SEM. The charge effect on cell response was estimated from cytotoxcity test (MTT assay). Tests were initially carried out on fibroblasts L929. Morphology of samples was imaged by SEM and fluorescent microscopy.

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ELECTROSPINNING OF POLYSACCHARIDES – A CASE STUDY OF STARCH

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Polysaccharides are natural abundant biomacromolecules, intensively used in drug delivery systems, tissue engineering, agriculture and food packaging.[1,2] However, difficulties regarding their solubility and processability have limited their applications. Electrospinning has been recognized as an efficient and versatile technique for fabrication of porous mats made of continuous fibers having nano- to micron-sized diameters. Unique properties of electrospun fibers, such as high porosity, high specific surface and light weight, combined with non-toxicity and biodegradability of polysaccharides may open alternative routes of versatile biomaterials' processing and applications. Herein, we report on a one-pot method for starch gelatinization and processing into electrospun fibers from formic acid (FA) solutions. FA played a triple role, simultaneously disrupting the starch granule, esterifying starch into starch-formate and acting as a dispersing medium for electrospinning. The optimal electrospinning conditions were time-dependent, occurring after the complete granule disruption and solubilization but before phase separation and aggregation took place (see Figure 1).[3] Optical micrographs showed that FA induced a disruption of starch granule with a loss of crystallinity confirmed by X-ray diffraction. As a result, starch fiber mats exhibited a higher elongation at break when compared to brittle starch films.

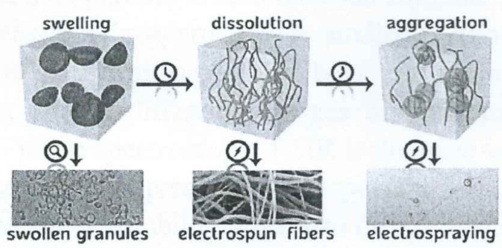

Figure 1. Time-dependent processability of starch-formate fibers from formic acid

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