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THE EFFECT OF SODIUM CHLOROPHYLLIN ON POLYVINYL ALCOHOL ELECTROSPUN NANOFIBER DIAMETERS

S. Jegina, A. Sutka, S. Kukle
Institute of Design Technologies, Riga Technical University
Kipsalas Str. 6, Riga, LV-1048, Latvia
Phone: +371 29187000
Email:sandra.jegina@edu.rtu.lv

ABSTRACT

The fiber diameter is the most important structural characteristic of electrospun nonwoven web and is crucial in the drug release process in medical applications. In order to make an electrospinnable solution using plant extracts, biocompatible polymers are used.

Polyvinyl alcohol (PVA) is known as non-toxic biodegradable polymer, which is compatible with human tissues and widely used in biomedical applications. Sodium chlorophyllin (SChl) contains derivatives of "a" and "b" chlorophyll (chlorines, sodium salts of chlorophylline acids etc.), sodium salts of resinous acids (pimaric-, isopimaric-, abietic- and labdane types), sodium salts of fatty acids (mainly oleic-, stearic- and linoleic). Due to such composition SChl has bacteriostatic, regenerative and deodorant properties, which could be useful in biomedical applications.

Several compositions of PVA solution in water (8 wt%) and different concentrations (1 – 15 wt%) of sodium chlorophyllin derived from spruce greenery were prepared using magnetic stirrer AREC Velp Scientifica.

The viscosity and conductivity measurements of PVA/SChl solutions were performed before spinning. Electrospinning was performed using Nanospider™ LAB 200 (Elmarco). The diameters of electrospun fibers were quantitatively evaluated from atomic force microscope (AFM) images. Microstructural features were analyzed using AFM Dimension Edge Veeco (Bruker) with silicone cantiliver OTESPA-R3, f0=300 kHz, k=26 N/m in tapping mode.

PVA/SChl nanofiber composites with different concentrations of sodium chlorophyllin (1wt%, 3 wt% and 5 wt%) were analyzed in the research. Also pure PVA solution and nanofiber web were tested in order to evaluate the effects of added sodium chlorophyllin.

The studies have shown that concentrations of SChl in the range from 1 wt% to 5 wt% have the ability to influence the viscosity and conductivity of the PVA solution and diameters of electrospun nanofiber composites.

Keywords: needleless electrospinning, nanofibers, sodium chlorophyllin, polyvinyl alcohol