Polish-Israeli Conference on Electrospinning and Tissue Engineering

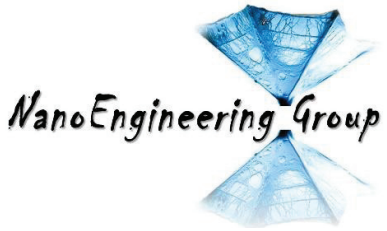
Programme and Abstracts

04 - 05 October 2018

Warsaw, Poland

Organizers

Laboratory of Polymers & Biomaterials at Institute of Fundamental Technological Research Polish Academy of Sciences (IPPT PAN) based on the fundamental knowledge in the area of polymer physics, materials science, chemistry and biotechnology, focuses its recent activity on biomaterials for tissue engineering. Great part of our activity is related to polymeric biodegradable scaffolds, mostly formed by electrospinning as nanofibrous structures, both for tissue regeneration and materials for controlled drug release.



Nano Engineering Group at Technion Israel Institute of Technology is focused on research in the field of molecular engineering of soft matter. The particular activities are related to the electrospinning including optimization of the parameters of the process, deep understanding of the fundamental physical facets of electrospinning as well as designing a composite materials for tissue engineering applications.

Objectives

The goal of PICETE conference is to bring together experts from around the world in order to exchange their knowledge, experience and research innovation in the basics of the electrospinning and the broad area of biomedical materials covering topics related to designing, fabrication, characterisation and tissue engineering applications.

The conference will include the following topics:

- Fundaments of electrospinning
- Optimization of electrospinning
- Properties of electrospun nanofibers
- Functionalization of electrospun nanofibers
- Electrospun nanofibers as scaffolds for tissue engineering/drug delivery systems
- Current trends in designing of polymeric biomaterials for tissue engineering/drug delivery systems

Smart piezoelectric scaffolds

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Abstract

The discovery of electric fields in biological tissues has led to great efforts in developing methods utilizing electrical stimulation for therapeutic applications. Native tissues, such as cartilage and bone, containing collagens and glycosamineglycans exhibit piezoelectric behavior, with electrical activity generated due to mechanical deformation through simple physiological movement. However, the use of piezoelectric materials in tissue engineering has still largely been unexplored.

The most important piezoelectric polymers will be discussed with emphasis on polyvinylidene fluoride (PVDF) and its copolymers. PVDF has relatively large piezelectricity among polymers, which is highly dependent on supermolecular structure which in turn is governed by conditions of material formation [e.g. 1, 2]. The relations between the conditions of formation, supermolecular structure and piezoelectricity of PVDF will be discussed. Recent achievements in the field of piezoelectric scaffolds, including nanofibrous scaffolds formed by electrospinning, for regenerative medicine strategies will be shown. Recent data [ ] indicate the possibility of stimulation of mesenchymal stem cell differentiation and corresponding extracellular matrix/tissue formation by piezoelectric scaffolds in physiological loading conditions. Preliminary results of PVDF nanofibers electrospinning performed in the Laboratory of Polymers and Biomaterials IPPT PAN at various parameters will be provided.

References

1. Sajkiewicz P., Wasiak A., Gocłowski Z., Phase transitions during stretching of poly(vinylidene fluoride), Eur. Polym. J., 35, 1999, 423-429
2. Gradys A., Sajkiewicz P., Adamovsky S., Minakov A., Schick C., Crystallization of poly(vinylidene fluoride) during ultra-fast cooling, Thermochimica Acta, 461, 2007, 153-157
3. Damaraju S. M., Shen Y., Elele E., Khusid B., Eshghinejad A., Li, J., Jaffe M., Arinzeh T. L., Three-dimensional piezoelectric fibrous scaffolds selectively promote mesenchymal stem cell differentiation, Biomaterials, 149, 2017, 51-62.

Biography

Pawel Lukasz Sajkiewicz is a professor of Materials Science and Engineering, leader of the Laboratory of Polymers and Biomaterials, at the Institute of Fundamental Technological Research, Polish Academy of Sciences (IPPT PAN). Expert in the field of synthetic and natural polymers, their structure, with recent emphasis on electrospun micro/nanofibers, both from fundamental and applied perspective as biodegradable scaffolds for tissue regeneration. Graduated from Faculty of Materials Science at Warsaw Technical University, PhD and habilitation at IPPT; postdoctoral Research Associate at the University of Tennessee, Materials Science and Engineering Department, Knoxville, Tennessee, USA.

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