THE COMMITTEE ON MECHANICS OF THE POLISH ACADEMY OF SCIENCES

RZESZÓW UNIVERSITY OF TECHNOLOGY

INSTITUTE OF FUNDAMENTAL TECHNOLOGICAL RESEARCH, POLISH ACADEMY OF SCIENCES

6TH CONFERENCE ON NANO- AND MICROMECHANICS

RZESZÓW, POLAND, 3-5 JULY 2019

Book of Abstracts

Editors:
M. Kmiotek, A. Kordos
Piezoelectric scaffolds - on the way to effective cellular mechanotransduction

P.L. Sajkiewicz¹, A. Zaszczyńska¹

Institute of Fundamental Technological Research Polish Academy of Sciences, Laboratory of Polymers and Biomaterials, Pawinińskiego 5B, 02-106 Warsaw, Poland

*psajk@ippt.pan.pl

Keywords: scaffolds, electrospinning, tissue engineering

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

The piezoelectricity of polyvinylidene fluoride PVDF is highly dependent on supramolecular structure which in turn is governed by conditions of material formation [1,2]. The relations between the conditions of formation, supramolecular structure and piezoelectricity of PVDF will be discussed. The nanofibrous structure of PVDF scaffolds is expected, mimicking part of extracellular matrix (ECM). Finally, our results of biological investigations in vitro using PVDF nanofibrous scaffolds under ultrasound stimulation together with the recent achievements reported in the literature will be shown.

In summary, we shown that using PVDF as piezoelectric polymer stimulated by ultrasound is advantageous for cells activity. The obtained preliminary results are promising from the perspective of tissue engineering applications.

Acknowledgements
Authors acknowledge Department of Ultrasound for sharing ultrasonic equipment for the tests.

References