UK-Poland Bioinspired Materials Conference

23rd-24th November 2020

Conference addressed to UK and Polish Early Career Researchers (postdocs and PhD students)

CONFERENCE PROGRAMME AND BOOK OF ABSTRACTS

ONLINE CONFERENCE VIA MICROSOFT TEAMS

OLIWIA JEZNACH

Oliwia Jeznach[1], Dorota Kołbuk[1], Paweł Sajkiewicz[1]

[1]Institute of Fundamental Technological Research, Polish Academy of Sciences Pawińskiego 5B, 02-106 Warsaw

Poster 23: Surface modification of polymer fibers based on aminolysis and gelatin immobilization as a method of improvement of cell-scaffold interaction

Surface modification is used in tissue engineering to improve cell-scaffold interaction without altering the bulk properties of the material. Various techniques are used to change surface properties, such as wettability, surface energy, topography, surface elasticity, or to introduce charged groups or bioactive motives that are important from the perspective of the biological application.[1,2,3]

In this study, we modified the surface of electrospun fibers made of poly(caprolactone) (PCL), poly(L-lactide-co-caprolactone) (PLCL) 70:30 or poly(L-lactide) PLLA. Firstly, we introduced amine groups on the surface of fibers using ethylenediamine aminolysis in a wide range of conditions. It was shown that PCL fibers require much more aggressive conditions than PLCL and PLLA. Our results confirmed that the presence of NH2 groups is beneficial for cell response, most likely due to their positive charge. On the other hand, aminolysis caused a decrease in the average molecular weight of polymers, which influences the mechanical properties of nonwovens. Hence, it is crucial to choose conditions of reaction, which enable maintaining mechanical strength.

In the second part, we immobilized gelatin on the surface of aminolyzed fibers using glutaraldehyde cross-linking. Chemical modification was compared to the physical adsorption of gelatin. It was shown that physisorption provides a lower concentration of gelatin and stability of the layer. However, complete hydrophilicity and improvement of cell morphology were observed in the case of all gelatin-covered samples.

[1] Bakry, Ahmed. "Synergistic effects of surface aminolysis and hydrolysis on improving fibroblast cell colonization within poly (L‐lactide) scaffolds." Journal of Applied Polymer Science (2020): 49643.

[2] Truong, Yen B., et al. "Collagen-based layer-by-layer coating on electrospun polymer scaffolds." Biomaterials 33(36) (2012): 9198-9204.

[3] Jeznach, Oliwia, Dorota Kolbuk, and Paweł Sajkiewicz. "Aminolysis of various aliphatic polyesters in a form of nanofibers and films." Polymers 11(10) (2019): 1669.

Acknowledgements: This research was funded by the Polish National Science Center (NCN), grant number 2016/23/B/ST8/03409 and supported by ESF, POWR.03.02.00-00-1028/17-00.