UNSATURATED POLYESTERS FOR BIO-TISSUE: EFFECT OF PDMS AND MULTIFUNCTIONAL HYDROXY COMPOUNDS ON STRUCTURE AND PROPERTIES

Sonata Gailiūnaitė[1], Saulutė Budrienė[1]

[1] Faculty of Chemistry and Geosciences, Department of Polymer Chemistry, Vilnius University, Vilnius, Lithuania
sonata.gailiunaite@chgf.stud.vu.lt

Tissue engineering combines the principles of material synthesis and cell transplantation to create replacement for damaged tissues or promote their regeneration. This field of science began to develop rapidly because of a critical gap between the number of patients on the organ transplant list and donors. Successful artificial tissue formation is highly dependent on the choice of biomaterials for the artificial carcass, and may therefore be one of the key aspects of successful application. [1]. The cells will reproduce and functionalize on frame, so the materials chosen for it should be biocompatible, also it must have mechanical strength, be flexible, biodegradable and non-toxic [2].

Biodegradable polymers have the advantage over ceramic and metal based biomaterials because, depending on the synthesis conditions and used materials, materials with various mechanical, physical and chemical properties can be obtained. Also, polymeric biomaterials are already widely used in the regeneration of muscle, cardiovascular and skin tissues. [3].

Aliphatic polyesters have recently been highlighted for their potential applications in biomedicine due to their degradability and biocompatibility. They undergo hydrolysis in aqueous media to non-toxic oligomers or monomers containing carboxy and hydroxy groups. This is very important because the polyester loses its place in proliferating cells and the degraded products are eliminated from the organism [3]. Most polyesters are elastic materials that are biocompatible and easy to synthesize. For these reasons, polyesters would be a great alternative to fabricate artificial carcass for tissue engineering [4].

The aim of this work was to obtain biocompatible and biodegradable films from polyesters modified with hydroxyl terminated PDMS. Polyester films were synthesized from maleic anhydride, azelaic acid, diethylene glycol/sorbitol/ polyethylene glycol and were chemically modified with hydroxyl terminated PDMS, at various initial molar ratios. Glycidyl methacrylate and/or buthyl methacrylate at various initial molar ratios were used as curing agents to obtain UV-curable films. The films were tested for swelling and solubility in hexane, ethanol and water. To investigate the hydrophilicity of films, a study of humidification angle was performed. The strength of the films was also measured by tensile test.

Acknowledgements

This research was funded by the European Social Fund under the No. 09.3.3-LMT-K-712 “Development of Competences of Scientists, other Researchers and Students through Practical Research Activities” measure (grant No. 09.3.3.-LMT-K-712-16-0270).

[1] Turksen et al., *Cell Biology and Translational Medicine, Volume 4* (Trans. Springer International Publishing, Switzerland, 2018).
[2] C. Yu et. al., Scanningless and continuous 3D bioprinting of human tissues with decellularized extracellular matrix, Biomaterials **194**, 1-13 (2019).
[3] H. T. Weng et. al., Mechanical and thermal properties of biodegradable hydroxyapatite/poly(sorbitol sebacate malate) composites, Songklanakarin Journal of Science and Technology **35(1)**, 57-61 (2013).
[4] H. Ye et. al., Polyester elastomers for soft tissue engineering, Chem. Soc. Rev. **47**, 4545-4580 (2018).