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Published in:
Express Polymer Letters

DOI:
10.3144/expresspolymlett.2016.73

Published: 01/10/2016

Document Version
Publisher's PDF, also known as Version of record

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Unspecified

Please cite the original version:
Seppälä, J. (2016). Editorial corner – A personal view 3D-printed polymers for biomedical applications. *Express Polymer Letters*, *10*(10), 788. https://doi.org/10.3144/expresspolymlett.2016.73

eXPRESS Polymer Letters Vol.10, No.10 (2016) 788
Available online at www.expresspolymlett.com
DOI: 10.3144/expresspolymlett.2016.73

Editorial corner – a personal view
3D-printed polymers for biomedical applications

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Great opportunities in science appear when significant technology leaps take place simultaneously in several complementary areas. This is the case in polymeric biomaterials' technology.

Amazing advances have been made in the additive manufacturing technologies, i.e. 3D-printing. It is a family of different layer by layer manufacturing methods like fused deposition modeling, powder laser sintering, ink-jet printing, stereo lithography, two or multi photon polymerization and hydrogel 3D-printing. All of them applicable for processing of polymeric materials. Essential developments have taken place also in biomedical imaging and 3D-design to create the necessary digital models needed for the 3D-printing. At the same time great progress has been achieved in biopolymers' development. They can be tailored to be biostable or bioresorbable in a controlled way, or in some cases even bioactive. Bioactivity has been achieved through addition of bioactive compounds like bioactive glass or through functionalization of the polymeric structure (www.kunststoffe-international.com/1332070, DOI: 10.1016/j.actbio.2011.06.039, DOI: 10.1016/j.compscitech.2012.10.014, DOI: 10.1002/jbm.b.32863, DOI: 10.1002/pola.27400, DOI: 10.1039/C5TB01468A).

The parallel advance which has taken place in the biomedical sciences has significantly improved the options in regenerative medicine and may even enable tissue engineering. For polymer research this important and fast developing area offers great opportunities of high societal impact. However, the demands for polymer properties are strict for the novel biomaterials. They should meet the various physical criteria set by the needs of the application, but in addition the demand of non-toxicity is a self-evident must in biomedical applications. Successful 3D-additive manufacturing sets requirements to master the viscosities and liquid to solid transitions in the printing process. In stereo lithography the oligomeric low viscosity prepolymers need to be fast photo curing; with photo curing chemistry that is non-toxic in the biological environment and can get approved by the authorities. Especially for resorbable polymers there is a need to find alternative curing chemistries in addition to acrylate or methacrylate based systems. (www.kunststoffe-international.com/1325854) Complementary research interplay is essential in this field of science. An excellent example of such an effort has been the ArtiVasc 3D-project funded by the 7th Framework Program of the European Union to prepare polymeric scaffolds for vascularized, cell tissue cultivated skin like tissue. Outcome of the project is presented in the video: ArtiVasc 3D on the Way to Bio-Artificial Tissue. Novel technologies, breakthroughs in biomedical sciences together with innovative novel polymers enable jointly significant enhancements for life!

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