HIGH-RESOLUTION 3D PRINTING BY MEANS OF FEMTOSECOND LASER INDUCED PHOTOCHEMISTRY

Aleksandr Ovsianikov

Research Group 3D Printing and Biofabrication, Institute of Materials Science and Technology, TU Wien (Technische Universität Wien), Getreidemarkt 9, Vienna
Head of Research | Founder, UpNano GmbH, Modecenterstraße 22/D36, Vienna
Austrian Cluster for Tissue Regeneration
https://www.tissue-regeneration.at

Additive manufacturing technologies, also referred to as 3D printing, are experiencing rapid development by providing disruptive solutions for different application areas. In the recent years, multiphoton lithography (MPL) emerged as a unique 3D printing method allowing to achieve feature size down to 100 nm level [1]. This method utilizes photochemistry induced by multiphoton absorption of ultra-short laser pulses. Depending on the material MPL can produce high-resolution volumetric structures, induce photodegradation or spatially resolved covalent binding of specific molecules in the volume of the sample [2]. Fabrication of complex high-resolution constructs in accordance to a computer-aided design (CAD) model is especially attractive for designing of 3D cell-culture matrices for biological and tissue engineering applications. For example, microscaffolds produced by MPL enabled novel tissue engineering strategy based on bottom up assembly [3]. Recently developed cell compatible and photopolymerizable hydrogels for MPL allowed to position this technology in the domain of bioprinting [4]. This presentation will review the recent progress of MPL for engineering and biomedical applications, as well as discuss the technological challenges of this technology on the way to widespread industrial applications.

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