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3D photofabrication by femtosecond laser pulses and its applications in biomedicine. ALEKSANDR OVSIANIKOV, XIAO SHIZHOU, MANGIRDAS MALINAUSKAS, BORIS CHICHKOV, Laser Zentrum Hannover e.V. — Two-photon polymerization (2PP) is a novel laser-based microstructuring technique. In this approach, the multiphoton absorption of femtosecond laser pulses is used to induce a highly localised chemical reaction leading to a photopolymerization of the material. By moving the laser focus in 3D the trace of modified material is created. In the next step, the unmodified material is removed by an appropriate developer, and the fabricated structure is revealed. Therefore, fabrication of any computer generated 3D structure by "direct laser recording" into the volume of photosensitive material is possible. Nonlinear nature of the interaction allows true 3D microfabrication and realisation of structures with submicrometer resolution. Recently, we studied possible applications of 2PP technique in biomedicine. It is a very attractive technology for the fabrication of drug delivery systems and medical implants. Application of 2PP in tissue engineering provides possibility to fabricate series of exactly identical scaffolds. Therefore, it is possible to conduct systematic studies of cell interactions in 3D environment. In this contribution, our recent advances in two-photon activated laser processing, properties of applied materials, and applications of this technology are discussed.

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