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Ultra short Pulses for Material Processing

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Ultrafast lasers have intensely been used in biological applications for the past ten years. Besides their routine use in nonlinear microscopy [1,2] and tissue surgery [3], they opened up the way for subcellular structure ablation such as a single dendritic spine or a mitochondrion with nanometer-scale precision, a procedure named as nanosurgery [4,5]. Recently, this precise mechanism is also increasingly used for the modification of bioimplant surfaces [6,7].

Surface modification of metal implants using ultrashort laser pulseshas beenexploited to increase biomechanicalfeaturesof implants surfaces [8]. It is well-known that surface chemistry and topography haveimportant functions in cell attachment on the surface, thus affecting the cell's physiology [9] anddirectly related to theefficiency of bioimplants to form a stable mechanic integration of tissue and implant [10]. Common methodsfor creating surface modifications are mechanical or chemical techniques, but insufficient for controllable texturing and targeted topography generation. Hence, ultrafast laser based surface modification offers an exceptional precision and allows generation of any desired surface texture and topography [11-13]. As researchers further realize this methodology in future, and as this technique is widely employed, it is indubitable that more efficient and long-lasting bioimplants will be developed.

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