

# Laser Surface Texturing on the Micro- and Nanoscale using (ultra) short pulsed lasers — Fundamentals and Applications

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## Abstract

The interaction of a component with its environment primarily depends on its surface properties—i.e. its surface chemical composition and its surface texture. By texturing the surface on the micro- and nanometer scale, the tribological, optical, wetting and other properties of the surface can be adapted and optimized for specific applications. Laser surface texturing, using (ultra) short pulsed laser sources (pulse durations ranging from fs to ns), offers a flexible, efficient and clean method to remove (ablation) or modify the surface of the material on the micro- and nanometer scale. This paper focus on the physical phenomena of laser-material interaction during laser ablation for surface texturing on the micrometer scale, as well as Laser-induced Periodic Surface Structures (LIPSS), which are surface textures on the nanometer scale. Further, strategies, methods and tools to scale the technology to industrial production rates are discussed. Finally, some applications of laser surface textured surfaces, including biomimetic engineered surfaces, are presented.

**Keywords:** Laser surface texturing, micro-machining, (ultra) short pulsed laser

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