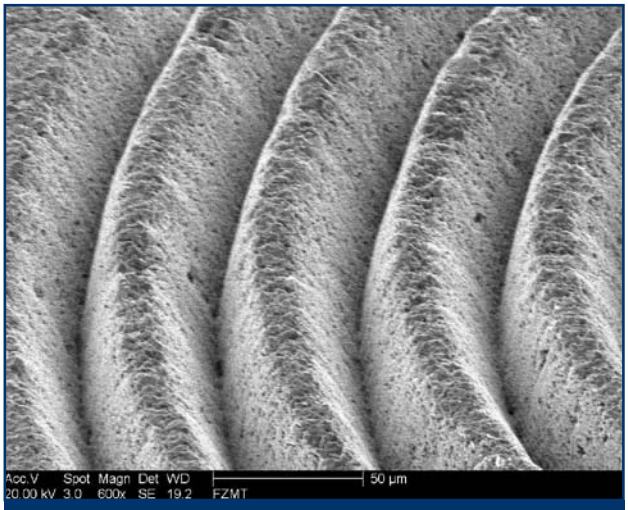
HIGH Q LASER®

Application Note

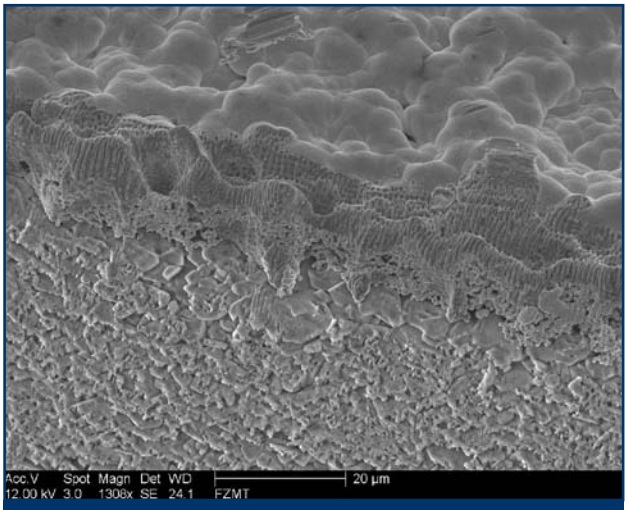
Ultrashort-pulse Laser structuring

Laser materials processing is of great interest for industrial applications as well as for scientific investigations. Main advantages of the laser as a manufacturing tool are the high speed at which a laser beam can be moved and, contrary to mechanical tools, laser light is not subject to wear and tear. Besides the wavelength, the pulse duration of the laser source is the main parameter influencing the nature of the laser-material coupling. Pulse durations of down to a few femtoseconds are available from state of the art laser systems. The high peak intensities provided by ultrashort pulses initiate multiphoton absorption mechanisms, bridging a band gap much larger than the photon energy. Thus, by applying ultrashort pulses the ablation of nearly any material is possible by multiphoton absorption.
The non-thermal nature of ultrashort pulsed ablation together with the ultrafast mechanism offers well-defined ablation threshold fluences and enables laser structuring with high precision.

Application example: Surface structuring of AlO_2-ceramics

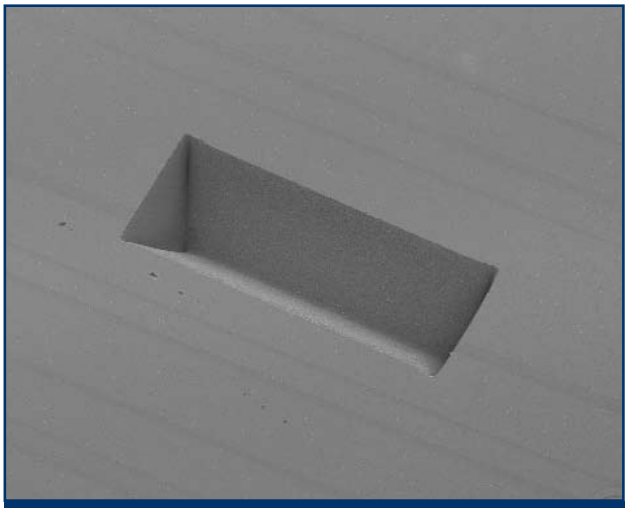


Material ceramic Al_2O_3 | **Laser** *femto*REGEN™ | τ = 350 fs, λ = 1040 nm



Lasercut Al_2O_3 ceramics with goldcoating on the top surface

Application example: Surface structuring and cutting of dielectrics and semiconductors



Material borosilicate glass | **Laser** *femto*REGEN™ | τ = 350 fs, λ = 1040 nm

Material 3C-SiC | **Laser** *femto*REGEN™ | τ = 350 fs, λ = 1040 nm

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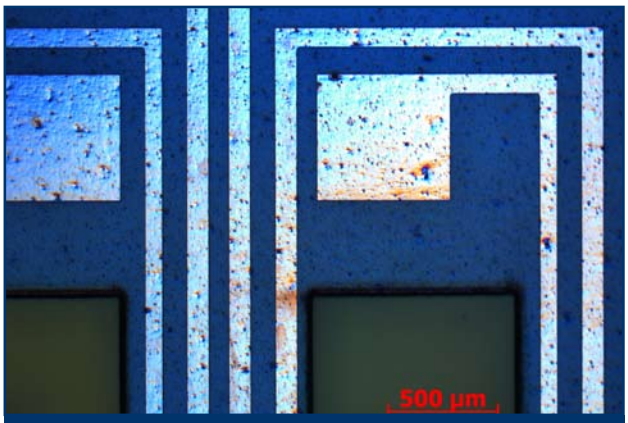
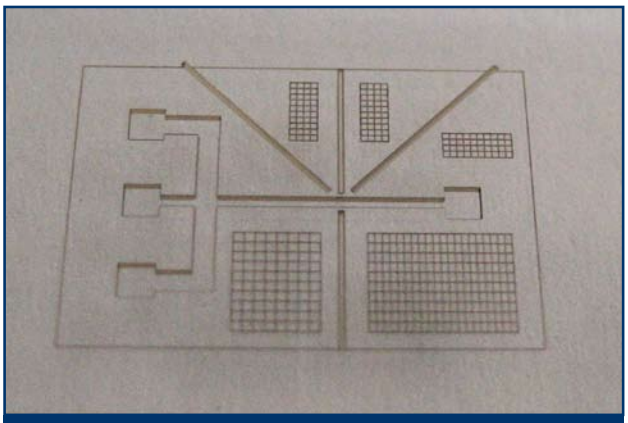
Application example: Cutting and structuring of polymers (sensors and microfluidic devices)



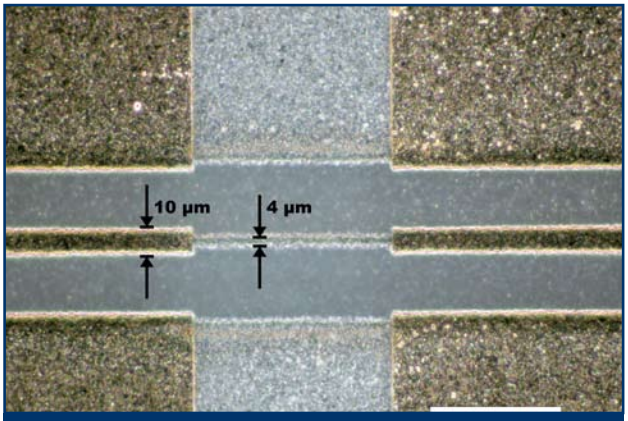
Material	**Laser**	
polymersensor	*femto*REGEN™	τ = 350 fs λ = 1040 nm



Material	**Laser**	
SU-8 on glass	*femto*REGEN™	τ = 350 fs λ = 520 nm

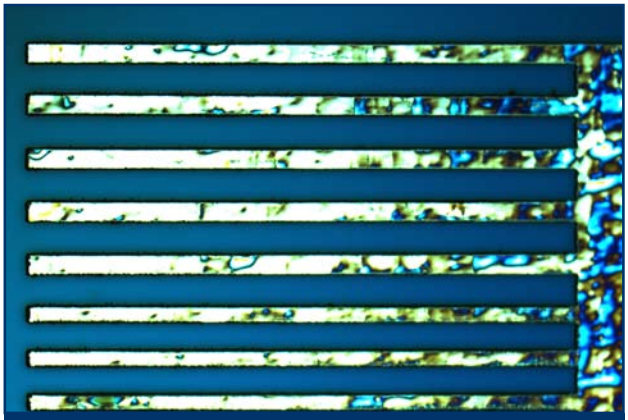
Application example: Thin film ablation (for automotive sensor)

Material	**Laser**	
silver on ceramics	*femto*REGEN™	τ = 350 fs λ = 1040 nm

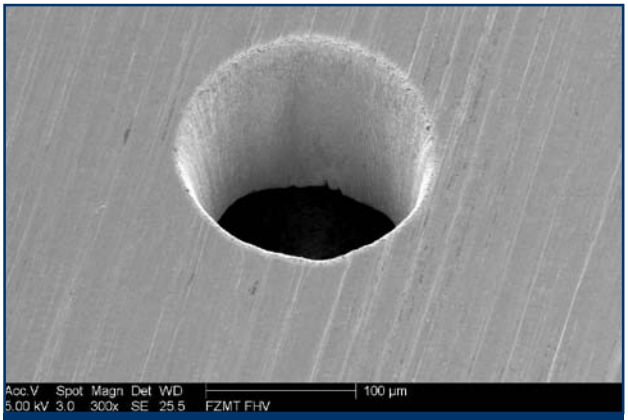


Material	**Laser**	
Au/Ag on ceramics	*femto*REGEN™	τ = 350 fs λ = 1040 nm

Application example: Cutting and drilling of metals



Material	**Laser**	
amorphous metal	*femto*REGEN™	τ = 350 fs λ = 1040 nm



Material	**Laser**	
steel	*pico*REGEN™	τ = 12 ps λ = 1064 nm

Images Courtesy Research Center for Microtechnology

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