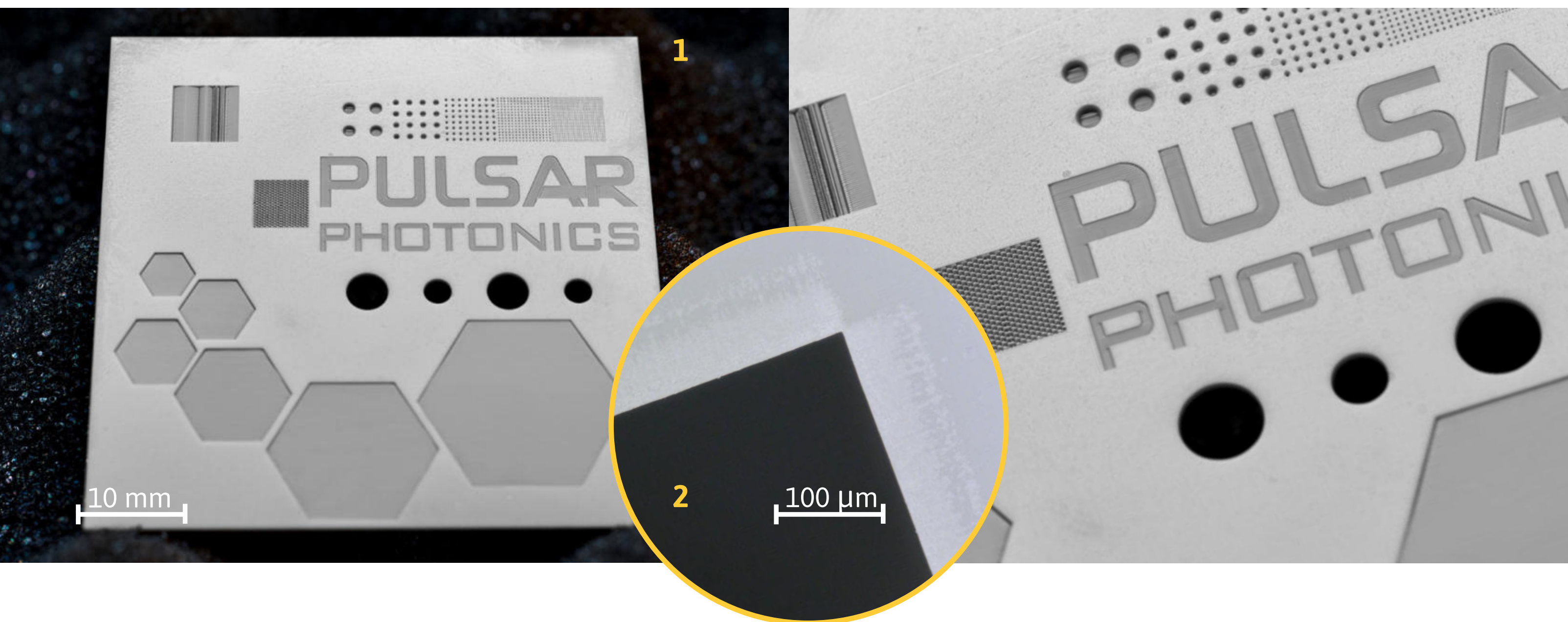

Processing of ceramic components with ultrashort pulse lasers

With their special physical and chemical properties, technical ceramics offer an ever wider range of applications. These include, for example, the manufacture of functional surfaces or sensors.
Due to the high hardness and brittleness of technical ceramics, machining such as cutting, ablating or drilling with mechanical processes is very time-consuming.
Laser processing of technical ceramics offers clear advantages here.

With the laser, ceramic components can be scored, cut and drilled with a high degree of geometrical freedom and without tool wear. Today, ceramic components are typically laser processed with cw lasers or nanosecond pulsed lasers. These allow fast processing, but the thermal energy input into the material can lead to damage.

Ultrashort pulsed lasers allow precise ceramic processing with low heat input into the material and highest precision. Thus it is possible to cut ceramics with narrow contour radius and to damage them without functional areas of ceramic sensors.

Processable materials
technical (sintered) ceramics, e.g:

- aluminium oxide (Al_2O_3)
- zirconia oxide (ZrO_2)
- silicon carbide (SiC)
- silicon nitride (SiN)
- aluminium nitride (AlN)
- boron nitride (BN)

Typical processings
- Ceramic scribing, cutting and drilling

Significant advantages
- precise cutting without heat damage
- almost free contours
- with tight curve radii (< 50µm)

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1 ceramic substrate processed with an ultrafast pulse laser with holes, cuts and 3D contours

2 microscopy image of an ultrafast pulse laser-cut emge Scale 1:400