

FOTURAN®

– a photostructurable glass

FOTURAN® is a photosensitive glass made by Schott. This photosensitivity allows it to be structured for a variety of purposes. **mikroglas** generates microstructures with an extremely high aspect ratio in FOTURAN®.

Which characteristics distinguish FOTURAN®?

- **micro-structurable**
- **chemically stable**
- transparency (glass)
- can be etched
- large etching depth (up to 2.5 mm)
- low self fluorescence
- temperature-resistance
- can be soldered (with solder glass)
- pore-free
- easy diffusion bonding
- biocompatible

In which areas, for instance is FOTURAN® applicable?

biotechnology

- **mikroglas** titerplates
- microfluidic systems
- lab on a chip
- PCR chips

microreaction technology

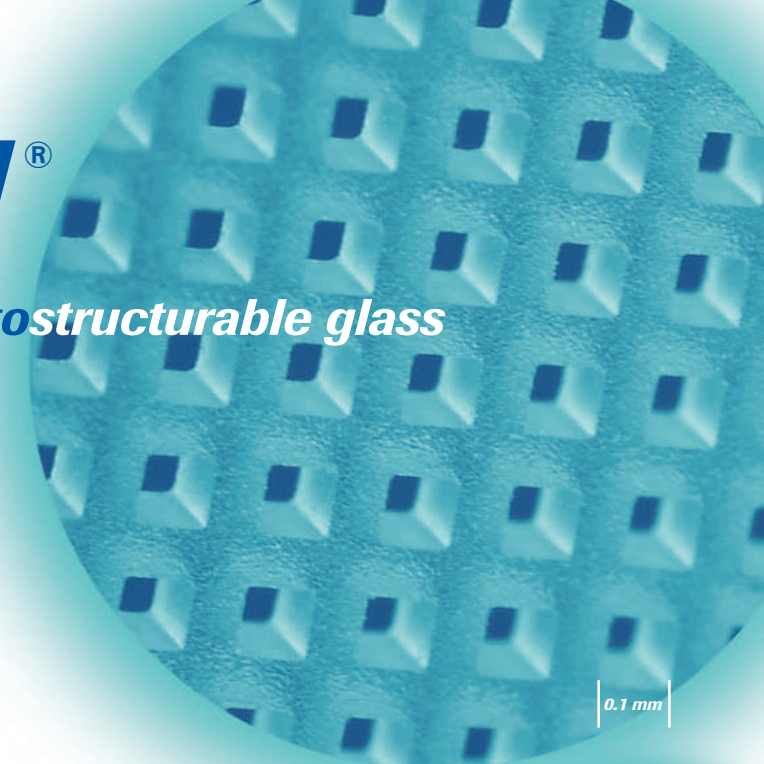
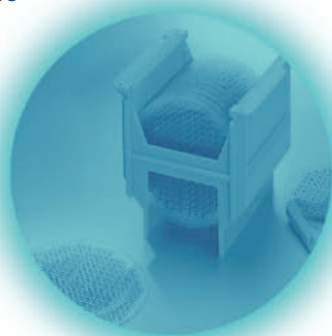
- **mikroglas** mixer
- **mikroglas** reactor
- **mikroglas** heat exchanger
- **mikroglas** microreaction system **mikroSyn**®

display technology

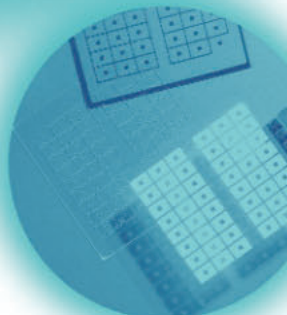
- spacers for FED
- components for X-ray scanners
- components for plasma screens

sensors and electronic

- components for flowmeters
- components for temperature sensors
- components for ink-jet printers
- electronic packaging



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Why use products made of FOTURAN®?

The sides of holes etched into the material are almost perpendicular to the surface. The slope may vary between 1 to 2°. Holes up to 3 mm in depth or an etching ratio of 20 : 1 is possible.

After fluoric acid processing, relief-etched FOTURAN® shows no surface damage, and thus its breaking strength is considerably higher than that of conventional glass. This even allows FOTURAN® components with microscopic structures to be subsequently machined using various processes.

Where high thermal expansion coefficients or high operating temperature limits (max. 750 °C) are required, microstructured FOTURAN® components can be ceramicized by further exposure and heat-treatment processing.

mikroglas would like to manufacture for you as well!



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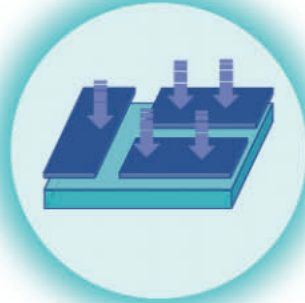
Which technology does mikroglas use for the structurization?

The well-known photolithographical structurization process in the semiconductor technology can be used in glass technology as well. Therefore **mikroglas** uses lithium aluminum silicate glasses with small amounts of cerium and silver.

Structurization steps

UV light exposure

- UV light exposure of the glass through a mask
- electrons recombine with silver ions to form silver atoms



annealing

- silver atoms aggregate to form silver specks under heat treatment (~ 500 °C)
- crystals of lithium metasilicate are formed around the silver specks at approx. 600 °C



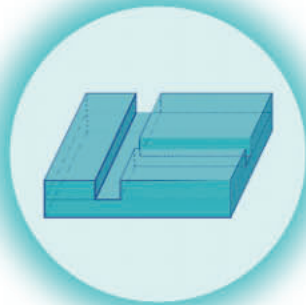
etching

- crystallized parts are etched with HF (at room temperature and with ultrasound)



connecting

- thermal bonding
- screen-printing
- electroplating



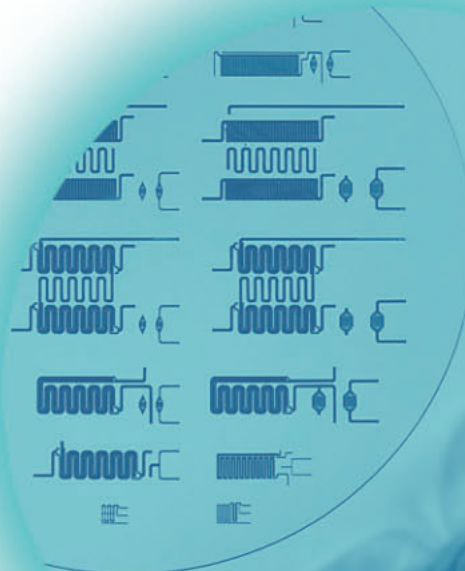
We use modern equipment for the structurization. Glass processing is done at **mikroglas** with grinding, polishing and edge-forming machines as well as mechanical saws.

What can mikroglas do for you?

mikroglas has innovative and long-term know-how in microtechnology and the traditional glass technology. This special knowledge and experience is used for the structurization of glass and ceramic to produce smallest structures (e.g. holes, grids, channel systems, etc.) with high aspect ratio.

mikroglas develops and manufactures components for your applications and provides entire problem solutions. FOTURAN® with its exceptional properties enables us to produce innovative products in the field of microtechnological applications. Using the process of microstructurization **mikroglas** generates structures in FOTURAN® in a variety of forms and sizes.

mikroglas supplies glasses for individual structurization.

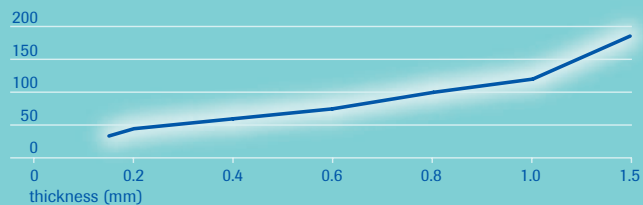


Technical Properties of FOTURAN®

Sizes of structures

minimum hole diameter depending on thickness

diameter of holes (µm)



diameter of holes

thickness of substrates

≥ 135 µm ± 0.005 mm	0.15 mm
≥ 145 µm ± 0.005 mm	0.2 mm
≥ 160 µm ± 0.015 mm	0.4 mm
≥ 175 µm ± 0.020 mm	0.6 mm
≥ 100 µm ± 0.020 mm	0.8 mm
≥ 120 µm ± 0.025 mm	1.0 mm
≥ 185 µm ± 0.030 mm	1.5 mm

Tolerances

Tolerances	Description
Roughness of etched structures	1–3 µm
Shrinkage	< 0.1 % (100 mm ± 100 µm)
	tolerance of thickness: ± 15 µm

Properties

Mechanical properties	Unit	Glass	Glass Ceramic (brown)
Young's modulus	[10 ³ N/mm ²]	78	88
Poisson's ratio	–	0.22	0.19
Knoop hardness	[N/mm ²]	4600	5200
Modulus of rupture	[N/mm ²]	60	150
Density	[g/cm ³]	2.37	2.41

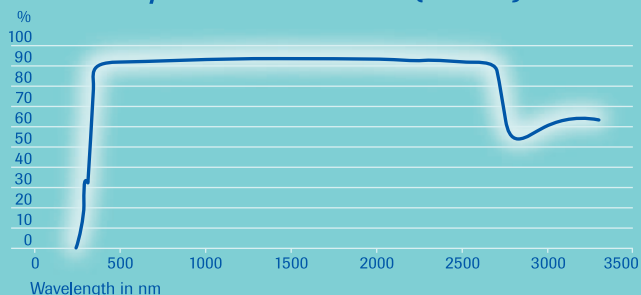
Thermal properties	Unit	Glass	Glass Ceramic (brown)
Thermal expansion α_{20-300}	[10 ⁻⁶ /K]	8.53	8.64
Thermal conductivity 20 °C	[W/mK]	1.35	2.73
Specific heat 25 °C	[cal/g°C]	0.88	0.22
Transformation temperature	[°C]	465	590
Maximum safe processing temperature	[°C]	400	700

Electrical properties	Unit	Glass	Glass Ceramic (brown)
Electrical conductivity 25 °C	[Ohm x cm]	8.1 x 10 ¹²	5.6 x 10 ¹⁶
Electrical conductivity 200 °C	[Ohm x cm]	1.3 x 10 ⁷	4.3 x 10 ⁷
Dielectric constant. E, 20 °C	1 MHz	6.5	5.7
Loss factor tan δ , 20 °C	1 MHz [x 10 ⁻⁴]	65	25

Chemical properties	Unit	Glass	Glass Ceramic (brown)
Water resistance DIN/ISO 719	[(µg) Na ₂ O/g]	468	1300
Acid resistance DIN 12116	[mg/dm ²]	0.4	0.9
Alkali resistance DIN/ISO 695	[mg/dm ²]	96	250

Optical properties	Unit	Glass	Glass Ceramic (brown)
Refractive index 546.1 nm, 25 °C		1.515	–
Transmission spectrum	[nm]	see diagram	–

Transmission spectrum FOTURAN® Glass (d = 1 mm)



Transmission spectrum FOTURAN® Glass (d = 1 mm)

