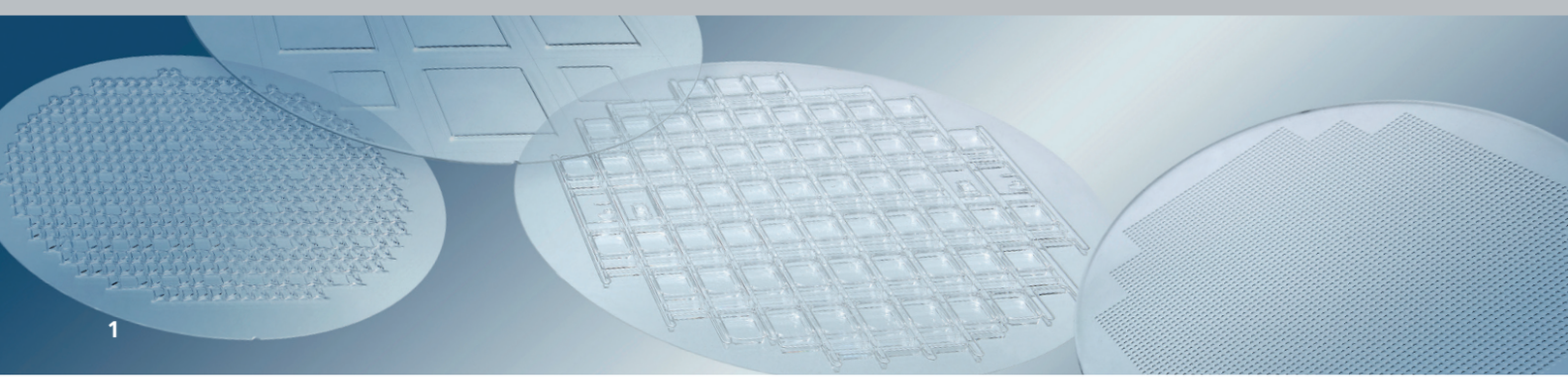
Fraunhofer
ISIT

FRAUNHOFER INSTITUTE FOR SILICON TECHNOLOGY ISIT



1 *Different structered glass wafer with caps and lenses.*

3D GLASS FORMING TECHNOLOGY

Fraunhofer Institute for Silicon Technology ISIT

Fraunhoferstraße 1
25524 Itzehoe, Germany

Contact Person

Dr. Vanessa Stenchly
Phone +49 (0) 4821 17-1494
vanessa.stenchly@isit.fraunhofer.de

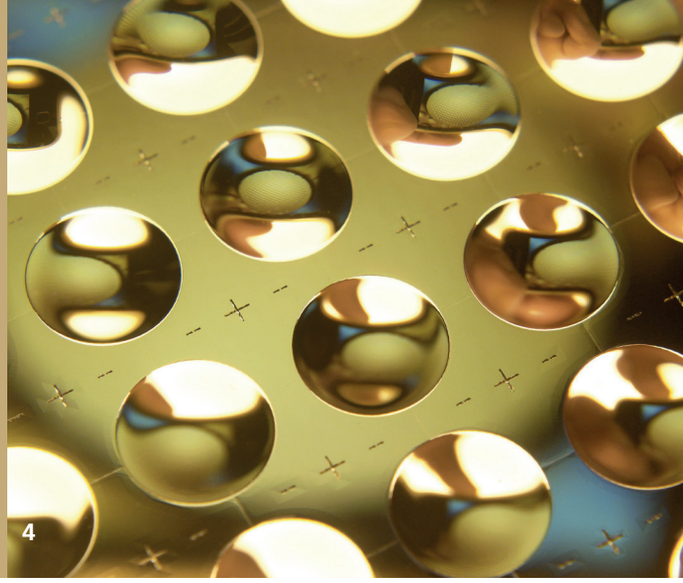
www.isit.fraunhofer.de

Motivation

Fraunhofer ISIT has a wide portfolio of qualified single process technologies available, which were combined to different specific technology process platforms. They form a kind of tool box to realize various applications. One of these process platforms is glass micromachining. Fraunhofer ISIT developed a process based on hot temperature viscous glass micro-machining. It is mainly used for the production of micro-lenses and glass packages with inclined window surfaces. Using this process, it is possible to structure glass wafers with high aspect ratios on wafer level. A structured silicon wafer is chosen as so-called primitive form, so glasses must be used whose softening temperature is well below that of silicon. This has the advantage that the standar-dized methods to structured silicon wafers of a clean room can be used. The etched structures or cavities correspond later the molded areas in the glass. The structured silicon wafer is then anodically bonded to a glass wafer. In this case, a defined pressure within the cavities is enclosed.
When a relative vacuum is enclosed the cavities and the heat treatment takes place under atmospheric pressure, the glass is pressed into the cavities. If an atmospheric pressure is enclosed and the heat treatment takes place under vacuum then the glass is forced out of the cavities. Depending on the application, the glass may now be further processed by grinding and polishing.

Fraunhofer ISIT
is participant of the

Forschungsfabrik
Mikroelektronik
Deutschland



Technology

- Proprietary glass forming process
- Anodic wafer bonding
- Material: borosilicate glasses
- CTE match to silicon
- Fabrication on 8" wafer

Technical data for lenses

- Plano convex, plano concave lenses
- Lens arrays
- Lens diameter: 100 µm – 8 mm
- Sag. height: max: 800 µm
- ROC: 100 µm – 20 mm

Technical data for optical packages

- Packages with planar windows
- Packages with inclined windows with angles up to 15°
- Cavity sizes 1mm up to 10 mm
- Cavity depth 0.1mm up to 4 mm
- Roughness < 1 nm (Ra)
- Window deformation < 100 nm (3.5 mm window size)
- Hermetic sealing

Technical data for Through Glass Vias (TGV)

- Wafer thickness: < 400 µm
- Contact via diameter: < 100 µm
- Contact via pitch: (depending on the aspect ratio): < 90 µm (1:4)
- Via material: Silicon

2 *Detail view of a glass wafer with silicon vias.*

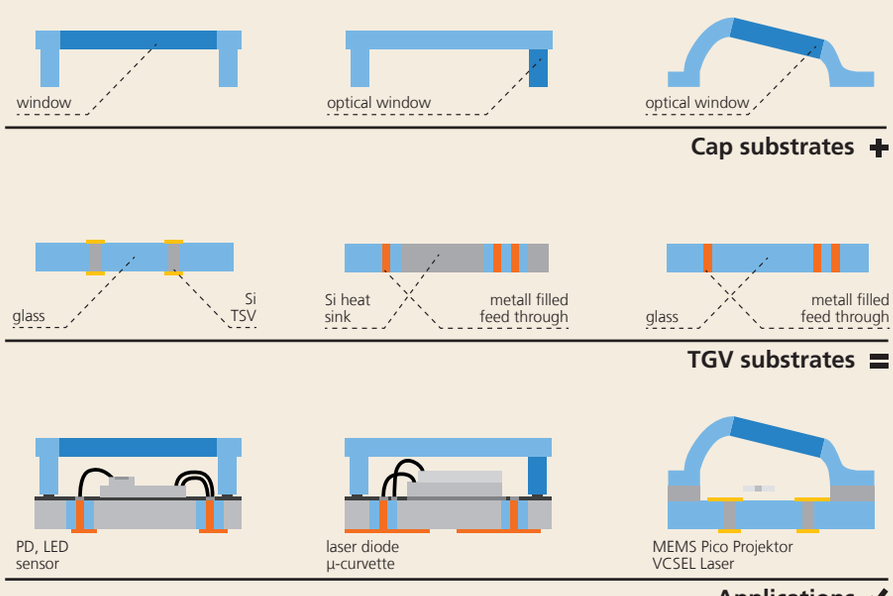
3 *Inclined windows on an 8" glass wafer.*

4 *Spherical micro mirrors coated with a thin Gold layer.*

5 *Schematic of different optical housing constructions supported by the modular packaging system.*

Applications

- Wafer Level Opto Packaging
- Hermetic Glass Packages
- Optical Windows
- Lens Arrays
- Micro Optics



5

Our Service

- Development and production of optical components (mirrors, lenses) on 8" glass substrates
- Realization of glass caps for housings of optical microsystems according to customer requirements
- Easy transfer to pilot production
- Access to cost-effective production of micro-optical components