Subject to alterations in specifications and other technical information. 09/2014.

LASER TRANSMISSION BONDING OF GLASS WITH GLASS

Task

In hybrid micro-systems technology, but also in medical-technical fields, hermetic sealing of functional components is of great importance to continuously protect them from ambient conditions. With substrates made, in part, of glass, the encapsulation currently takes place via adhesive or soldering processes. These processes lack long-term stable gas tightness and have a high thermal load in the furnace-based soldering process – clear disadvantages. Laser-based processes provide an alternative. The advantages of the laser are, in addition to an exactly controllable heat affected zone, high geometrical freedom.

Method

Laser transmission bonding is based on transmission joining: The laser radiation is transmitted through a joining partner and absorbed by the other joining partner. With joining partners out of the same working materials, absorbing intermediate layers are used. The selective laser transmission bonding of glass with glass is currently being conducted at Fraunhofer ILT with a disc laser (λ = 1030 nm).

The laser radiation used is not absorbed by the basic glass material, so for the absorption metallic intermediate layers are used. Within the scope of process development, suitable process parameters, such as laser power, feed or scanning speed and contact pressure, are being investigated for different metallic intermediate layer materials.

Result

To date, glass-glass bonds can be produced successfully with titanium as the intermediate material. Bonds were generated at chip level (5 x 5 mm^2), both those with only one joining partner coated with a metallic intermediate layer as well as those by which both joining partners were overlaid with intermediate layers. Thanks to adapted process parameters and scanning strategies, large-area and selective bonds were generated with bond widths ≥ 50 µm.

Applications

Fields of application can be found, e.g., in hybrid micro-systems technology, microfluidics and medical technology. Possible applications for this process include encapsulating micro-sensors or micro-actuators or components of optical or medical-technical products.

Contact

Dipl.-Ing. Anselm Wissinger
Telephone +49 241 8906-500
anselm.wissinger@ilt.fraunhofer.de

Dr. Alexander Olowinsky
Telephone +49 241 8906-491
alexander.olowinsky@ilt.fraunhofer.de

1 Laser transmission bonding of a glass microfluidic chip with a glass injection tube.